

MEASURING *made* EASY:

OR, THE
Description and Use
OF

COGGESHALL'S
SLIDING-RULE.

CONTAINING

Instructions for Measuring 'all Manner
of Timber, both by the Common Way,
and the true Way: With Directions for
taking the Dimensions of Trees, and the
Allowance for Bark, &c. perform'd both
by the Rule, and by Arithmetick; by which
may be measured all manner of Superficies;
as, *Board, Glass, Plaistering, Painting,*
Wainscoting, Tying, Paving, Land, &c.
both by the Rule and Arithmetick.

To which is now added,

The Description of *Scamozzi's* Lines, with their
Use in finding the Lengths and Angles of *Raf-*
ters, Hips, Collar-Beams, &c.

By J. GOOD, *Teacher of the Mathematics,*

Carefully Corrected, and much Enlarg'd
by J. Atkinson, Sen.

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R E A D E R.

I Here present you with some Fruits of my spare Hours, wherein I have endeavoured to render the Use of the Sliding-Rule more Plain and Easy than ever it appeared before.

I have here delivered in a few Rules, but yet in a Plain and Easy Manner, Problems for the measuring all manner of Regular Figures, and Plain Superficies, such as Board, Glass, Painting, Plaistering, Paving, Tyling, Joyners and Masons Works, &c. and that both by the Sliding-Rule, and by Arithmetick.

In the next Place you have Directions for the Measuring all manner of Timber or Stone, by the Sliding-Rule, and Arithmetically, by a new Method, whereby the true Content of Round Timber or Trees, may be found.

I remain a Well-Wisher to the Mathematicks.

JOHN GOOD.



I.

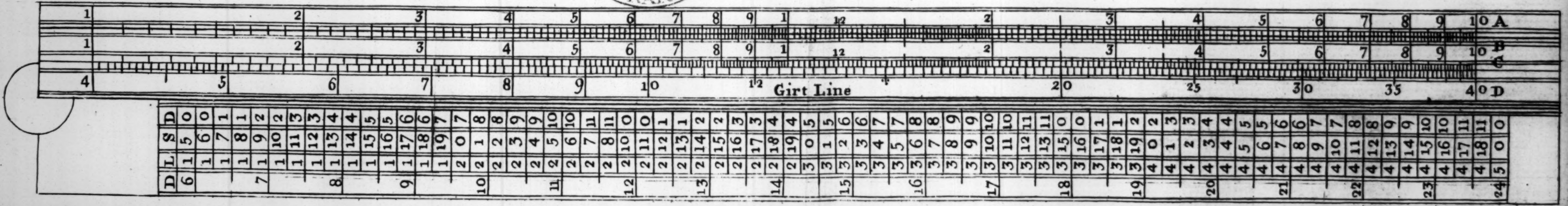
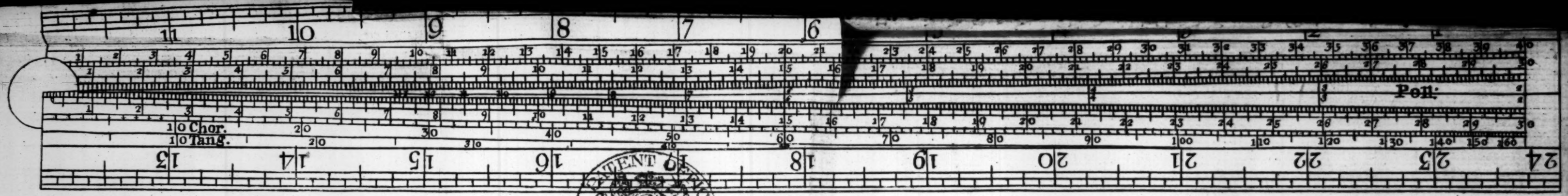
The Description and Use of Coggeshall's R U L E.

THIS Rule is fram'd three Ways ;
Sliding by one another, like *Glasier's*
Rules ; *Sliding* on one side of a *Two-*
Foot Joint-Rule ; and one part *Sliding* on the
other, in a Foot long, the back part being flat,
on which are sundry *Lines* or *Scales*.

Upon the foresaid *Sliding-side* of the Rule,
are four Lines of *Numbers*, three are *Double-*
lines, and one a single *Line of Numbers* ; mark-
ed in the *Figure* annexed, with A, B, C, and
D.

The three marked A, B, and C, are called
Double Lines of Numbers ; being figur'd 1, 2,
3, 4, 5, 6, 7, 8, 9. Then, 1, 2, 3, 4, 5, 6,
7, 8, 9, and 10 at the End.

That marked D, is the *Single Line of Num-*
bers, and figur'd thus, 4, 5, 6, 7, 8, 9, 10,
20, 30, and 40 at the End, even with and
under 10 in the *Double-line* next to it, this is
called the *Girt-line*, and is so marked in the
Figure.



The Figures on the Three *Double-lines* of Numbers may be encreased or decreased at pleasure ; thus, 1 at the Beginning may be called 10, 100, or 1000, then 2 is 20, 200, or 2000, so that when 1 at the Beginning is 10, then 1 in the middle is 100, and then 10 at the End is 1000 ; but if 1 at the Beginning is counted for 1, then 1 in the Middle is 10, and 10 at the End is 100.

And as the Figures are altered, so must the Stroaks or Divisions between them be altered in their Value according, to the Number of the parts they are divided into : As thus, the distance from 1 to 2 is divided into 10 parts, and each Tenth is divided into 5 parts ; and that from 2 to 3 is divided into 10 parts ; and each Tenth into two parts, and so on from 3 to 5 ; then the distance from 5 to 6, is divided into 10 parts only ; and so on to 1 in the Middle of the *Rule*, or the First Part of the *Double Line of Numbers*. The *Second Part*, or *Radius*, is divided like the *First Radius*.

The *Girt Line* marked D, is divided from 10 to 5 into 10 parts, and each Tenth into 5 parts, and so on from 5 to 10, then from 10 to 20, it's divided into 10 parts, and each Tenth is divided into 4 parts ; so on all the way from 20 to 40 at

the End, which is right against 10 at the End of the *Double Line of Numbers*.

The Lines on the Back-side of this *Rule* that slide on one Side, are these, a Line of *Inch Measure* from 1 to 12, each Inch divided into Halts, Quarters, and Half-Quarters; another Line of *Inch Measure* from 1 to 12, each Inch divided into 10 Equal Parts; and a *Line of Foot Measure* being one Foot divided into 100 Equal Parts, and Figur'd 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100 even with 12 on Inch Measure.

And the Back-side of the *Sliding Piece* is divided into Inches, Halves, Quarters, and Half Quarters, and figur'd from 12 to 24; so that it may be slid out to 2 Foot to measure the Length of a Tree, or any thing else you have occasion to measure.

Note, The *Line of Foot-measure* turns Inches, Halves, Quarters, &c. into Decimal parts of a Foot, which is most ready for Measuring by this *Rule*, as also by *Arithmetick*; which is fully explained in the Table following.

A TABLE Reducing Inches, Halves, Quarters, and Half-Quarters, into Decimal Parts of a Foot ; Or, reducing Inch-Measure into Foot-Measure.

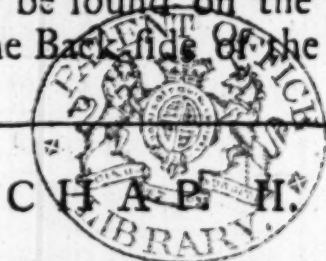
Inches	Deci- mal.	Parts of an Inch.						
		$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$
0	.000	.010	.021	.031	.042	.052	.062	.073
1	.083	.094	.104	.115	.125	.135	.146	.156
2	.167	.177	.188	.198	.208	.219	.229	.24
3	.25	.26	.271	.281	.292	.302	.313	.323
4	.333	.344	.35	.365	.275	.385	.396	.406
5	.417	.427	.438	.448	.458	.469	.479	.49
6	.5	.51	.521	.531	.542	.552	.569	.573
7	.583	.594	.604	.615	.625	.635	.646	.656
8	.667	.677	.688	.698	.708	.719	.729	.74
9	.75	.76	.771	.781	.792	.802	.813	.823
10	.833	.844	.854	.865	.875	.885	.89	.906
11	.917	.927	.937	.948	.958	.969	.979	.99

By this Table $\frac{1}{8}$ or Half Quarter of an Inch in *Foot Measure* in Decimals, is .01, or $\frac{1}{100}$ part of a Foot ; $\frac{1}{4}$ of an Inch is .021, or shorter .02, that is $\frac{2}{100}$ parts of a Foot ; and so on in the upper Line of the Table. And in the next Line under it, 1 Inch is

A 4

.083

.083 or $\frac{8}{100}$ of a Foot ; Inch $1\frac{1}{8}$ is .094 or $\frac{9}{100}$; Inch $1\frac{1}{4}$ is, .104 or $\frac{1}{10}$; Inch $1\frac{3}{8}$ is .115, or $\frac{11}{100}$ of a Foot, and so on ; And in the First Column under Decimals 1 Inch is .083 ; 2 Inches .167 ; 3 Inches is .25 ; 4 Inches .333 ; and so on to 11 Inches is .917 or $\frac{9}{10}$. All these may be found on the *Line of Foot-Measure* on the Back side of the Rule.



The Use of the Double-Scale, shewing how to find the Area of any Plain Superficies ; and also Arithmetically.

PROB. I. *To measure a Geometrical Square.*

BY the *Sliding - Rule*. Let there be a Square whose Sides are each three Feet and a half. Set 1 on the Line B, to 3 and $\frac{1}{2}$ on the Line A, then against $3\frac{1}{2}$ on the Line B, is $12\frac{1}{4}$ Feet on the Line A, which is the Content of such a Square.

1	2	3	a
4	5	6	b
7	8	9	f
c	d	e	g

Arith-

Arithmetically.

		F.P.
The Side of the Square	Feet $3\frac{1}{2}$ or	3.5
Multiplied by it self		3.5
		175
		105
The Product is		Feet 12.25



This Arithmetical Operation is thus performed, multiply the Side of the Square, namely $3\frac{1}{2}$, or $3\frac{4}{8}$ into it self, the Product is 1225, from which cut off 2 places, because there are 2 Decimals in both Fractions, and it will stand thus $12\frac{25}{100}$; which is 12 Feet and a quarter.

Note, The Figure it self shews the Content in Feet by Inspection, for if you tell the greater Squares, you see they are nine in Number; *a* and *b* makes 10; *c* and *d* makes 11; *e* and *f*, makes 12; and the little Square *g* in the Corner, makes one quarter of a Foot, which is in all 12 Feet.

More Examples by the Rule.

Length of the side	$5\frac{1}{4}$ Feet	}	$27\frac{1}{2}$ Feet
Length of the side	$7\frac{1}{2}$ Feet		$56\frac{3}{4}$ Feet
Length of the side	$10\frac{3}{4}$ Feet		$115\frac{1}{2}$ Feet
Length of the side	13 Feet		169 Feet

P R O B.

P R O B. II. *To measure a Long-Square by the Sliding-Rule ; and also by Arithmetick.*

L E T there be a Long Square, whose longest side is 27 Feet and a half, the shortest 16 Feet and a quarter : set 1 on the Line B, to $16\frac{1}{4}$ on the Line A, then against $27\frac{1}{2}$, on the Line B, is $446\frac{3}{4}$ Feet, the Content of the Long Square on the Line A.

By Decimal Arithmetick.

Multiply the Length by the Breadth, and from the Product cut off as many Places to the Right-hand as there are Decimals in the Length and Breadth ; the Integers remaining to the Left-hand are the square Feet.

<i>Example.</i>		<i>F.Par.</i>
Length $27\frac{1}{2}$ Feet or	_____	27.50
Breadth $16\frac{1}{4}$ Feet or	_____	16.25
		13750
		5500
		16500
		2750
		446.8750

$\div$ 27 $\frac{1}{2}$
 $\times$ 16 $\frac{1}{4}$

 Area. 446. f

But

(11).

But Contracted thus.

F.Par.

Breadth Feet $16\frac{1}{4}$ or in Decimals ——— 16.25

Length Feet $27\frac{1}{4}$ or 27.25, inverted is — 5.72

3250

1137

81

The Product is the Content req. Feet — 446.8

In this *Contracted Way*, Multiply each Figure of the Inverted Number (beginning at the Right-hand) by the Figure over it, and putting the several Multiplications even at the Right-hand, as above : Thus multiplying by 2, the Product is 3250 : Then say 7 times 5 is 35, leave out 5 and carry 3 in your Mind, then say 7 times 2 is 14, and 3 I carried makes 17, set 7 just under the 0, and carry the 1 in your mind ; saying 7 times 6 is 42, and 1 I carried makes 43, set 3 under 5 and carry the 4 in your mind ; and so on to the End of that Line : Then say 5 times 2 is 10, reject the 0, and carry 1 in your mind ; then say 5 times 6 is 30, and 1 carried makes 31, set 1 just under the 7, and carry the 3 in your mind ; saying 5 times 1 is 5, and 3 I carried makes 8, setting it under the 3, and the multiplying is done : Then add them together and it's 446.8 ; that is Feet 446 $\frac{8}{10}$ or 446 $\frac{4}{5}$ as before.

Note

Note, Where the Units place of the inverted Number stands, so many places are to be cut off in the Product ; As in this Example, 7 the Units place, when inverted stands under 2, the first place in Decimals, and therefore one place must be cut off in the Product at the Right-hand ; so that the Product 4468 must be 446.8 or $446\frac{8}{10}$; observe the like in all that follows.

More Examples by the Sliding-Rule.

		Contents
Breadth 11 $\frac{1}{2}$ Feet	Length 15 $\frac{1}{4}$	{ 174 $\frac{1}{4}$ Feet 371 $\frac{3}{4}$ Feet 676 $\frac{3}{4}$ Feet
Breadth 17 $\frac{1}{4}$ Feet	Length 21 $\frac{1}{2}$	
Breadth 22 $\frac{3}{4}$ Feet	Length 19 $\frac{3}{4}$	

P R O B. III. *How to measure a Rhombus by the Sliding-Rule.*

Suppose the Side of a *Rhombus* be 8 Feet 6 Inches and a quarter, and the Breadth, or Line A B, 8 Feet 4 Inches and a half : That is the Length is Feet, $8\frac{12}{16}$, and Breadth is Feet $8\frac{9}{16}$. Set 1 on the Line B, to 8 Feet $\frac{12}{16}$ on the Line A ; then against 8 Feet $\frac{9}{16}$ on the Line B, is 71 Feet $\frac{40}{16}$ parts of a Foot on the Line A ; now if you would find the Value of the Decimal, or part of the Foot, look for $\frac{40}{16}$ on your *Rule*, and you will find against it 4 $\frac{3}{4}$ Inches, so that the Content of this *Rhombus* is 71 Feet 4 $\frac{3}{4}$ Inches.

By

By Decimal Arithmetick.

Multiply the Breadth AB, by the Length of any of the Sides, and from the Product cut off as many places to the Right-hand as are Decimals in the Length and Breadth, the Integers remaining to the Left-hand are the square Feet requir'd.

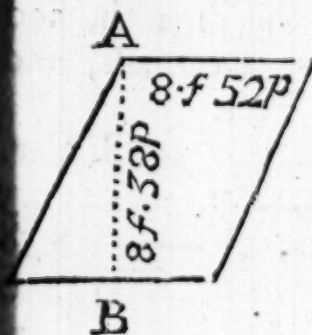
*Example.**F. P.*The Length Feet 8.06 $\frac{1}{4}$ Inches, or — 8.52Breadth AB, Feet 8.04 $\frac{1}{2}$ Inches, or — 8.38

6816

2556

6816

The Content is Feet 71.3976
or 71 Feet 4 $\frac{3}{4}$ Inches.



And contracted is thus,

*F.P.*Length Feet 8.06 Inches 8 $\frac{1}{4}$ is in Decim. 8.52Breadth AB, Feet 8.04 Inches and $\frac{1}{2}$ is } 8.38

8.38, inverted is ————— }

6816

255

68

The Content required as before is Feet — 71.39

P R O B.

P R O B. IV. *How to measure a Rhomboides by the Sliding-Rule.*

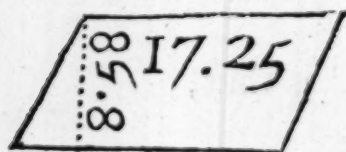
A Amit the Length of a *Rhomboides* be 17 Feet 3 Inches, or $17.\overset{2}{\underset{0}{0}}\overset{2}{\underset{0}{0}}$, and the true Breadth 8 Feet 7 Inches, or $8.\overset{1}{\underset{0}{0}}\overset{7}{\underset{0}{0}}$, what is the Content? Set 1 on the Line B, to 17.25 on the Line A; then against 8.58 on the Line B, is 148 Feet on the Line A.

By Decimal Arithmetick.

Multiply the Length by the Breadth, and from the Product cut off the Decimals, and the Remainder is the Square Feet.

Example.

The Length 17 Feet 3 Inches, or ——— 17.25
The Breadth 8 Feet 7 Inches, or ——— 8.58



F. Par.
13800
8625
13800

The Content is Ft. 148.0059
or 148 Feet.

By Contraction thus,

Length 17 Feet 3 Inches in Decimals — 17.25
Breadth 8 Ft. 7 Inch. or 8.58, inverted is 85.8

F. Par.
13850
8625
138

The Content as before is ——— Feet 148 00

P R O B.

P R O B. V. *How to measure a Triangle by the Sliding-Rule.*

Theorem. **E** Very Triangle is half of that Long-Square whole Length and Breadth is equal to the Perpendicular and Base. Therefore from the greatest Angle let fall a Line Perpendicular, to the side (opposite to the greatest Angle) called the Base; and then to find the Content of any Triangle, take half the Length of the Base and the whole Perpendicular; or half the Length of the Perpendicular, and the whole Base.

Example.

Let the Base of a Triangle be 4 Feet, $\frac{1}{10}$ or 4 Feet 1 Inch $\frac{1}{4}$, and the *Perpendicular* 2 Feet $\frac{1}{10}$, or 2 Feet 1 Inch $\frac{1}{4}$, the half of the one is 2 Feet 7 parts, and the half of the other is 1 Foot 7 parts; set 1 on the Line B, to 4.15 on the Line A, then against 1.07, half the *Perpendicular* on the Line B, is 4 Feet and almost half for the Content. Or if you set 1 on the Line B, to 1.07 on the Line A; against 4.15 on the Line B, is 4 and almost a half on the Line A. Again, another way, if you set 1 on the Line B, to 4.1 on the Line A; then against 2.15 on the Line B, is 8 Feet $\frac{2}{10}$ (which is about 11 Inches) on the Line A, the half thereof is 4 Feet 5 $\frac{1}{2}$ Inches, which is the *Content* of the Triangle.

By

By Decimal Arithmetick all the three Ways.

F. P.

1st Way { The whole Base is ———— 4.15
The half Perpendicular is — 1.07

2905

415

The Content 4 Ft. 5½ Inches, or Ft. 4.4405

2^d Way { The whole Perpendicular — 2.15
The half Base ————— 2.07

1505

430

The Content 4 Feet 5½ Inches, or Feet 4.4505

3^d Way { The whole Base ————— 4.15
The whole Perpendicular — 2.15

2075

415

830

The Product is Feet 8.9225



The half is Feet 4.4612

The Content is 4 Feet 5
Inches and ½, as before.

By

(17)

By Contraction thus,

F. Par.

The whole Base ————— 4.15

Whose Perpendicular 2.15 inverted is ————— 51.2

830

41

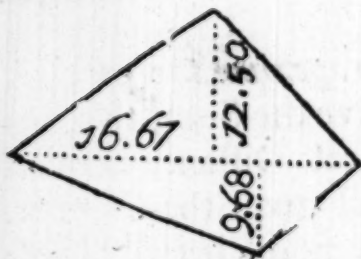
21

The Product is ————— 8.92

Half is the Cont. 4 Feet $5\frac{1}{2}$ Inc. as before 4.46

P R O B. VI. Of the Measuring a Trapezium.

A Trapezium, is a Figure of 4 Sides, but is not a Square, a Long-square, a Rhombus, nor a Rhomboides ; which before it can be measured must be divided into Triangles, by a Line from one Corner to his opposite one, through the Trapezium ; so will the two Perpendiculars fall from the other two Angles upon this Diagonal, or Cross-line ; then the Content of the Figures are to be found by the last Problem,



Example. Suppose the Dimensions of a Trapezium were as followeth, the Base is 16 Feet 8 Inches, the one Perpendicular 12 Feet 6 Inches, and the

other 9 Feet 8 Inches, what is the Content ?

B

De.

(18)

Decimally.

	F. Par.
One Perpendicular 12 Feet 6 Inches or	12.50
The other 9 Feet 8 Inches, or	9.68
The Sum is	22.18
The half Sum is	11.09
Multiply by the whols Base	16.67
	7763
	6654
	6654
	1109
The Content 184 Ft. 10 $\frac{1}{2}$ Inch. or Ft.	184.8703

By Contraction thus :

	F. Par.
Half Sum of the two Perp. 11 F. 1 Inc. or	11.08
Base 16 Feet 8 Inch. or 16.67 inverted is	76.61
	11.08
	665
	67
	8

The Content as before is ——— Feet 184.8

Note, If two sides of a *Trapezium* are parallel, add them together, and halve the Sum, this half Sum multiplied by the nearest Distance betwixt those two sides, the Product gives the Content. Or if you measure it in the middle betwixt those two Lines that are parallel, it will be the same.

P R O B.

PROB. VII. To measure any Regular Figure,

OF these Regular Figures there are several sorts, as the *Pentagon*, contained under five sides; the *Hexagon*, contained under six sides; the *Heptagon*, contained under seven sides; and the *Octagon*, contained under eight sides, &c.

Now to measure any of these sorts of Figures practically, it is by dividing them into Triangles, which is done by drawing Lines from the Center of the Figure to every Angle, then from the Center to the middle of any one of the Triangles sides, draw a Line, which Line is the Perpendicular. Having the Perpendicular and Base of any of these Triangles (by *Prob. 5.*) find the Content of one Triangle, and that multiplied by the Number of Triangles, finds the Content of the Figure.

Note, To find the Center of any Regular Figure, of even Number of sides, draw a Line from one Angle to its opposite, the middle of which is the Center; but if your Figure have any odd Number of sides, as 5, or 7, &c. draw Lines from any two Angles to the middle of their opposite sides, their Intersection is the Center.

C H A P. III. *The Use of the Girt-line, and Line of Numbers, called the Double-scale, in measuring of Circles and their Parts.*

Prob. I. **L** E T the Diameter of a Circle be 2 Feet $\frac{2}{10}$, to find the Content, set 11 on the Girt-line D, to 95 on the Double-line C; then against 2 Feet $\frac{2}{10}$ on the Girt-line D, is 3 Feet $\frac{9}{10}$ on the Double-scale of Numbers C, which is the Content.

Arithmetically.

The Rule. Multiply the Diameter in Inches by it self, and then by this fixt Number .7854 and from the Product cut off from the Right-hand 4 Figures, the Remainder to the Left-hand is the Content of the Circle in Inches, which divided by 144, gives the Feet, and the Remainder, if any, divide by 12, gives the Inches.

Example.

The Fixt Number ————— .7854
The Diameter multiplied ————— 729 Inches
70686

The Diameter 27 Inches 15708
The Diameter 27 Inches 54978 F.In.

189 144)572.5566(3.11

54 432
Diam. multipl. 729 Inc. 12)140

12
021

012
09

The Content is 3 Foot 11 Inches $\frac{1}{2}$

The

The Rule may be thus, multiply the Diameter in *Foot-measure* by itself, the Product is called the *Square of the Diameter*, then multiply by the fixt Number 0.7854 in the *Contracted way*, and this last Product is the Content required, as follows.

The Diameter 2 Feet $\frac{23}{100}$ or ——— 2.25

The Diameter 2 Feet $\frac{23}{100}$ inverted is ——— 52.2

450

45

11

The Square of the Diameter is Feet ——— 5.06

The fixt Number 0.7854 inverted is ——— 4587

3542

405

25

2

Content 3 F. 11 Inch. $\frac{1}{4}$ almost, or Feet 3.974

P R O B. II. *To find the Content of a Semicircle.*

BY having the Diameter by the last Problem, find the Content of the whole Circle, the half thereof is the Content of the *Semicircle*. I think this needs no Example.

P R O B. III. *To find the Content of a Quarter of a Circle, commonly called a Quadrant.*

Example. **T**HERE is a Quadrant, whose Semidiameter is 7 Feet, and the

the Circuit of the Arch is 11 Feet, what is the Content? Set 1 on the Double-line B, to 7 the Semidiameter on the Double-line A, then against 5 Feet $1\frac{5}{8}$ (which is half the Circuit of the Arch) on B, is $38\frac{1}{2}$ on A, the Content 38 Feet 6 Inches, or $38\frac{3}{4}$.

PROB. IV. *To find the Content of a Sector of a Circle.*

The Rule. SET 1 on the Double-line, to the Semidiameter on the Double-line, then against half the Circuit of the Arch on the Double-line, is the Content on the other Double-line. This needs no *Example*.

PROB. V. *How to measure the Segment of a Circle.*

A Segment of a Circle, is a strait Line drawn thro' the Circle, but not thro' the Center, divides a Circle into two parts or Segments; and the lesser is thus measured. Let the Sector be measured, whereof the Segment is part, then subtract the Triangular Part, the Remainder is the Content of the Segment: But to the greater Segment, the Content of the Triangle included is to be added.

C H A P. IV.

The Use of the Double-Scale ; shewing how to measure all manner of Superficies ; as Board, Glass, Painting, Plaistering, Wainscoting, Tyling, Paving, &c. by the Sliding-Rule, and Arithmetically.

1. *In measuring Boards.*

P R O B. I. Let there be a Board whose Breadth is 27 Inches $\frac{1}{4}$, or $27 \frac{1^0}{4^0}$, and the Length 15 Foot $\frac{1}{4}$, or $15 \frac{2^1}{4^0}$, what is the Content by the *Sliding-Rule*.

Example.

Set 12 on the Double Scale B, to $27 \frac{1}{4}$ on the Double Scale A, then against $15 \frac{1}{4}$ Feet on the Double Scale B, is 35 Feet, the Content on the Double Scale A.

Decimally.

The Rule. Multiply the Length in Feet by the Breadth in Inches, and cut off so many Figures from the Right-hand, as are Decimals in your Length and Breadth, the Remainder divided by 12, the Quotient is the Feet, and the Remainder (if any) the odd Inches.

B 4

Examp.

(24)

Example, Length is ——— Feet 15.25
Breadth is ——— Inches 27.50



76250
10675
3050 F.In.
12)419.3750(34.11
36
059

The Content is 34 Ft. 11 Inch 48
11 Inches

The Length 15 Feet $\frac{1}{4}$, or ——— Feet 15.25
Breadth 27 Inch $\frac{1}{2}$, or 27.5 inverted is — 5.72

3050
1068
76

Product is 419 Inch $\frac{4}{10}$ as before, Inches 419.4

But if the Breadth be taken in Foot-measure,
it's done without Division as follows,

F.Par,

The Length as before, 15 Feet $\frac{1}{4}$, ——— 15.25
Breadth 27 Inch. $\frac{1}{2}$, or 2 Ft. $\frac{27}{100}$ inverted 92.2

3050
305
137

Content is 34 Ft. 11 Inch. as before, or Ft. 34.92

And by the Sliding Rule it's thus : Set 1
on the Double Scale B, to 22.9 on the Double
Scale

Scale A ; then against 15.25 on the Double Scale B, is almost 35 Feet on the Double Scale A, the Content as before:

Or, by the *Rule of Practice*, when the Length is in Feet and Inches, and the Breadth also in the same, counting for 1 Foot in Breadth, the whole Length is the Content, and for the Inches, according to its Aliquot parts of a Foot or 12 Inches ; as it follows, in the last *Example*.

A Board whose Length is 15 Feet 3 Inches, and Breadth 27 Inches $\frac{1}{2}$ or 2 Feet 3 Inches $\frac{1}{2}$. F.Inch.

The Length ————— 15.03

Set it down again ————— 15.03

Divide by 4, because 3 Inc. is $\frac{1}{4}$ of a Foot 3.09 $\frac{1}{4}$

Div. the last by 6, because $\frac{1}{2}$ In. is $\frac{1}{6}$ of 3 In. 0.07 $\frac{1}{2}$

And altogether is the Content required—34.11 $\frac{1}{2}$

In like manner the *Examples* following may be done, both by the *Foot-measure*, and by this *Rule of Practice*, which is worth the Learner's minding.

More Examples.

The Breadth 9 Inch	}	Length 13 Feet	}	Con. 9 Feet $\frac{1}{4}$
The Breadth 21 Inch		Length 19 Feet		Con. 33 Feet $\frac{1}{4}$
The Breadth 25 Inch		Length 29 $\frac{1}{2}$ Feet		Con. 61 Feet $\frac{1}{2}$

PROB. II. *Another Way when the Dimensions are Feet and Parts, and the Content is required in Feet and Parts, by the Sliding Rule*

Let

Let there be a Board whose Length is 24 Feet $\frac{1}{4}$, and the Breadth 1 Foot $\frac{1}{2}$, what is the Content ?

Example.

Set 1 on the Double-scale B, to 1 $\frac{1}{2}$ on the Double-scale A ; then against 24 $\frac{1}{4}$ on the Double-scale B, is 37 Feet $\frac{1}{8}$ on the Double-scale A, which is the Content.

More Examples.

Breadth $3\frac{1}{4}$ Feet	}	Length 20 feet	}	65 feet
Breadth $7\frac{1}{4}$ Feet		Length 25 feet		187 $\frac{1}{4}$ feet
Breadth 12 Feet		Length 30 feet		360 feet
Breadth 15 Feet		Length 35 feet		525 feet

How to work this second *Problem* Decimally, as is taught *Chap. 2. Prob. 2.*

Example.

Length	_____	F.Par.
Breadth	_____	24.75
		1.50
		123750
		2475

Content is 37 Ft. $\frac{1}{8}$ or 8 Inch. $\frac{1}{4}$ or Feet 37.1250

And by Contraction thus, the said *Example.*

Length 24 Feet $\frac{1}{4}$, or _____	F.Par.
Breadth 1 Foot $\frac{1}{2}$, or 1.5, inverted is _____	24.75
	5.1
	2475
	1237

The Content 37 Feet 1 Inch $\frac{1}{4}$, or Feet — 37.12

+

Ex-

Examples Decimally Contracted.

Breadth 4.27	Len. 06.21	{	26 $\frac{51}{100}$	or 26 feet 6 Inc.
Breadth 8.46	Len. 11.32		95 $\frac{77}{100}$	or 95 feet 6 Inc.
Breadth 12.54	Len. 15.35		92 $\frac{43}{100}$	or 92 feet 5 Inc.
Breadth 16.74	Len. 21.42		358 $\frac{87}{100}$	or 358 feet 6 Inc.

P R O B. III. *Directions for the measuring of most sorts of Artificers Works, and first of Glaziers Work, with the Manner of taking Dimensions.*

THE best way to measure *Glaziers Work* is by the *Sliding Rule*, and the Dimensions are taken very exact even to $\frac{1}{8}$ of an Inch; they commonly agree for their Work by the Foot, whether the *Glass* be Old or New, Squares or Quarries. *Note*, Sash-Windows are glazed by the Square; that is, they tell how many Squares there be in all the Lights, and then reckon what they come to at so much the Score, or Dozen.

P R O B. IV.

Let there be a Pane of Glass 29 $\frac{1}{2}$ Inches long, and 7 Inches broad; what is the Content?

Example.

By the *Sliding-Rule*. Set 144 (represented by 1.44) on the Line B, to 7 Inches on the Line A, then against 29 $\frac{1}{2}$ on the Line B, is 1 Foot and almost a half on the Line A, or Decimally 1 Foot $1\frac{4}{10}$. *More*

More Examples.

Breadth $3\frac{1}{2}$ Inch	Length $20\frac{1}{4}$ Inch	49 parts, or 5 In.
Breadth $5\frac{1}{4}$ Inch	Length $25\frac{1}{2}$ Inch	92 parts, or 11 In.
Breadth $9\frac{3}{4}$ Inch	Length $30\frac{3}{4}$ Inch	2 feet 1 Inch.
Breadth $13\frac{1}{4}$ Inch	Length 35 Inch	3 feet 2 Inches,

The foregoing Problem Arithmetically.

Multiply the Length in Inches and Parts, by the Breadth in Inches and Parts, and from the Right-hand of the Product cut off so many Figures as are Decimals in the Length and Breadth (if there be any) and the Remainder divide by 144, the Quotient is the Feet, and if any thing remain, divide it by 12, the Quotient is Inches.

Example.

	In. Par.
Length in Inches and Parts	— 29 5
Breadth in Inches and Parts	— 7.0
	144)206.50(1.5
	144
	12)062(5 Inches
	60

The Content is 1 Foot 5 Inc. — 02
and Remainder 2.

To perform this *Decimally*, without *Division*.
Take the Length and Breadth in Foot measure, and then it's thus ;

(29)

Example.

F.Par.

The Length 29 Inches $\frac{1}{2}$, or ————— 2.46

The Breadth 7 Inches or 0.58, inverted is—85

1230

197

The Content is 1 Foot 5 Inch. $\frac{1}{4}$, or Feet 1.427

After the same manner may all the foregoing Examples be wrought.

R O B. V. *Directions for measuring Joiners and Painters Work; with the manner of taking their Dimensions.*

Joiners and Painters Work, are generally agreed for by the Yard, and therefore having cast up their Dimensions, they bring the whole Sum into Yards, by dividing the Feet by 9.

Now in taking the Dimensions of Joiners, or Painter's Work, such as Polleſtion, and Bead-work, you muſt by a Line girt Bends and Hollows, and ſo bring it down to the Bottom, after which meaſure the Length of the Line by your Rule, ſetting it down for one of the Dimensions, then meaſure the Length of the former Height, and ſet it down for a ſecond Dimension.

Note, That in Joiners Meaſure, Window-ſhutters and Doors, are Work and half, becauſe they are worked on both ſides. The

The Paintings of Windows are generally agreed for by so much the *Light*, and *Casements* at so much a *Casement*.

In *Joyners* and *Painters Work*, Deductions are made for all Windows and Chimneys.

Example.

A *Joyner* hath wainscotted a Room 44 Feet and a half in Compass, 9 Feet 3 quartets in Height; what is the Content by the *Sliding Rule*?

Set 1 on the Double Scale B, to 44 Feet on the Double-Scale A, then against 9 Feet three quarters on the Double-Scale B, is 43 Feet $\frac{2}{3}$ on the Double-Scale A, the Content. Or thus, set 9 on the Line B, to $44\frac{1}{2}$ on the Line A, then against $9\frac{3}{4}$ on the Line B, is 4 Yards on the Line A, which is the Content.

Decimally.

F.Par.

The Compass of the Room 44.50

The Height ————— 9.75

22250

31150

40050 yds. feet in

9)433.8750(48 01 10

36

The Content is 48 Yards

1 Foot 10 Inches $\frac{1}{2}$

973

72

01

(31)

And by *Contraction*, the said *Example* is thus,

F.Par.

The Compass of the Room, 44 Feet $\frac{1}{2}$ is 44.5

The Height 9 Feet $\frac{1}{4}$ or 9.75, inverted is 57.9

40.05

3.11

22

The Product is ————— Feet 433.8

The Feet multiplied by 0.111 inverted is 111.0

4338

434

43

The Content as before in Yards is — 48.15

How to measure Painters Work by the Sliding-Rule.

Example. There is a piece of Painting 13 Feet $\frac{1}{2}$ broad, and 23 $\frac{1}{2}$ Feet long. Set 9 on the Double Scale B, to 13 $\frac{1}{2}$ on the Double Scale A, then against 23 $\frac{1}{2}$ on the Double Scale B, is 35 Yards $\frac{1}{4}$ on the Double Scale A, which is the Content of such a piece of Painting.

Decimally

(32)

Decimally.

F.Par.

Length 23 Feet $\frac{1}{2}$ or — 23.50

Breadth 12 Feet $\frac{1}{2}$ or — 13.50



117500

7050

2350 yds. Ft. Inc.

9)317.2500(35 : 2 : 3

27

047

45

02 foot

Content is 35 Yards
2 Feet 3 Inches

More Examples.

Breadth 4 $\frac{1}{2}$ feet	}	Length 22 ft.	}	11 Yards
Breadth 15 $\frac{1}{4}$ feet		Length 19 $\frac{1}{2}$ ft.		33 Yards
Breadth 10 feet		Length 30 ft.		33 Yards $\frac{1}{16}$
Breadth 19 feet		Length 29 ft.		61 Yards $\frac{1}{4}$

PROB. VI. *The measuring of Plasterers and Painters Work by the Sliding-Rule.*

Example 1. Of Plastering.

LET there be a Ceiling plaistered, whose Length is 25 Feet 3 Inches, and the Breadth 15 Feet 6 Inches: Set 9 on the Double Scale B, to 25 $\frac{1}{4}$ on the Double Scale A; then against 15 $\frac{1}{2}$ on the Double Scale B, is 43 Yards and almost a half, on the Double Scale A, which is the Content.

Example

Example 2. Of Paving.

Let there be a piece of a Paving $34\frac{1}{2}$ Feet long, and $12\frac{1}{2}$ Feet broad; set 9 on B, to $34\frac{1}{2}$ on A, then against $12\frac{1}{2}$ on B, is almost 48 Yards the Content.

P R O B. VII.

THE measuring such Superficies as are measured by the square of 10 Feet (viz. 100 Feet in a Square; and if you multiply 10 by 10 it makes 100) such as *Flooring, Roofing, Partitioning, Tyling, &c.*

By the Sliding-Rule.

The Rule. Set 100, or 1 in the middle, to the Length; against the Breadth is the Content.

Example.

There is a Floor whose Length is 61 Feet and a half, the Breadth 14 Feet and a quarter, set 100 on B, to $61\frac{1}{2}$ on A; then against $14\frac{1}{4}$ on the *Double-Scale* B, is 8 Square $\frac{1}{4}$ on the *Double-Scale* A, for the Content, being 8 Square 75 Feet.

Decimally.

Multiply the Length by the Breadth, and from the Product cut off two more Decimals than is in the Length and Breadth, the Figures remaining are the Squares.

C

Ex-

*Example.**F. Par.*Length $61 \frac{1}{2}$ Feet or in Foot-measure — 61.50Breadth $14 \frac{1}{4}$ Feet or in Foot-measure — 14.25

30750

12300

24600

6150

Content $8 \frac{3}{4}$ Squares, or 76 Feet — 8.763750By *Contraction* the same *Example* is thus,Breadth $14 \frac{1}{4}$ Feet is in Foot-measure Feet 14.25Length $61 \frac{1}{2}$ Feet, or 61.5 inverted is — 5.16

8550

142

71

Product (cutting off 3 places is) Square 8.763

*More Examples.**Contents.*

Length 42 feet	}	Breadth $24 \frac{1}{2}$ feet	}	10 squares 29 feet
Length 64 feet		Breadth 29 feet		18 squares 56 feet
Length 86 feet		Breadth $35 \frac{1}{2}$ feet		30 squares 53 feet

Deductions in this Problem.

In *Carpenters Work*, you are to deduct for all *Well-boles* in your *Flooring*, for all *Chimney-hearths*, and the like.

Also in *Partitioning*, Deductions must be made for all *Doors* and *Windows* that are measured in.

In *Roofing* make no Deductions for *Window-shafts*, or *Sky-Lights*, because they are more Trouble to the Workman than the Stuff is worth that would cover them.

C H A P.

C H A P. V.

Having in the former Part of this Treatise shewed the measuring all manner of Superficies, likewise all sorts of Regular Figures : I shall now give you some Instructions for the taking the Dimensions of Trees, or round Timber, and so proceed to the Measuring of such, and all manner of Solids.

THE Tree being cut down, the Custom is to girt it, as is shewed in the beginning of the next *Chapter*, and for the Length they account from the But-End, up so far as the Tree will hold half a Foot Girt when twice folded.

The Dimensions being taken, the Tree is to be measured by *Chapter* the sixth, as square Timber.

If the Tree have great Boughs that will hold half a Foot Girt, such Boughs are called *Timber*, and they are measured and are added to the whole.

1. *Note*, If round, rough *Timber* be measured for Sale ; the common Way among Artificers in allowing for Rind or Bark is thus : If the fourth part of the Girt or Circumference of the Tree be $\frac{1}{4}$ of a Foot, they allow $\frac{1}{4}$ of an Inch half quarter. If the fourth part of the Circumference

be a Foot, they allow $\frac{1}{10}$ or one Inch and almost a quarter; if one Foot $\frac{1}{2}$ Girt $\frac{1}{10}$ or an Inch and above three quarters for the Bark, &c. But for *Beach*, *Elm*, *Ash*, and such that is thin bark'd, then the Allowance must be a small matter less.

2. I have seen great Difference in the Girt of a Tree in the Space of two Feet, or less, and that hath been generally where one or two Arms have been cut off: In such a Case it is necessary to Girt the Tree twice or thrice, if there be any great Difference, or otherwise there will be Loss to the Buyer or Seller. Again, they say the Buyer hath Privilege to Girt any where between the Middle and the Ground End, if it be for his Advantage.

Lastly, The *Content* of any piece of *Timber* being found in Feet, if divided by 50, you have the *Content* in Loads: But some will have a Load to be 40 Solid Foot, therefore you may take which of the two is most customary with you. The Reason why the Difference is, they say, because it is supposed that 40 Feet of round Timber, or 50 Feet of hewn Timber, weigh about a Tunn, or twenty Hundred Weight, which is commonly accounted a Cart-Load.

C H A P. VI. *The measuring of Round Timber the common Way.*

TAKE the Length in Feet, Half-Feet (and if desired) in Quarters, then measure half way back again, where Girt the Tree with a small Chord or Chalk-line: Double this Line twice very even. This fourth part of the Girt or Circumference measure in Inches, Halves, and Quarters of Inches; but be sure the Length be given in Feet, &c. and the sides of the Square or one fourth of the Girt in Inches.

So you have always three Numbers given, to find the fourth, *viz.* 12 on the Girt-line for the first, the Length in Feet always for the second, and the Side of the Square for the third, in Inches, Halves and Quarters.

Now we come to the *Rule*. Set 12 on the Girt-line D, to the Length (in Feet, &c.) on the Double-Scale C, then against the side of the Square on the Girt-line D, in Inches, (Halves and Quarters) you will find, on the Double-Scale C, the Content.

Note, This Rule is General.

Example 1. Suppose the Girt of a Tree in the middle be 64 Inches, and the Length 31 Feet, what is the Content? Set 12 on the Girt-line D, to 31 Feet on the Double-Scale C;

C 3

then

then against 16, the one fourth of 64, on the Girt-line D, is 55 Feet, the Content on the Double-Scale C.

2. A piece of Timber is 15 Feet long, and one fourth of the Girt 42 Inches : Set 12 on the Girt-line D, to 15 on the second Length of the Double-scale C ; then against 42 at the beginning of the Girt-line D, is on the Double Scale C, 184 Feet the Content, reckoning the first 1 at the Beginning of the Line of *Numbers* (or Double-scale) to be 100, the 8 Grand Divisions 80, the two small ones 4 ; so accounting all together makes (as I said before) 184 Feet.

3. The Length is 9 Feet three quarters, and one fourth of the Girt 39 Inches, set 12 on the Girt-line D to $9\frac{3}{4}$ on the Line of Numbers C, and against 39 at the Beginning of the Girt-line D, is 103 Feet the Content on the Double-scale of Numbers C.

4. The Length 9 Inches ; the Quarter of the Girt is 35 Inches. Now because the Length being not one Foot, measure it by your Line of Foot-measure ; and see what part of a Foot it makes, a Foot supposed to be divided into a hundred Parts : Or do thus, set 12 on the Double-scale B, to 100 on the Double-scale A ; then against the Length in Inches, namely, 9 on the Double-line B, is 75 on the Double-scale A, for the Decimal or part
of

of a Foot : Then set 12 on the Girt-line D, to 75 in the first Length of the *Double-line C*, then against 35 on the Girt-line D, is 6 Feet $\frac{4}{18}$, or almost half a Foot on the *Double-Scale C*, for the *Content*.

5. A *Rail* is 16 Feet long, the Quarter of the Girt 3 Inches ; set 12 on the Girt-line D, to 16 on the first Length of the *Double-scale C*, then against 30 (now called 3,) on the Girt-line D, is just 1 Foot the *Content*, on the *Double-line C*.

More Examples.

One fourth of the Girt or side of the Square in these Ex- amples is	}	11 Inches	The length in feet	40 $\frac{1}{2}$	}	The Content in Feet and Parts are	34 feet
		16 Inches		39 $\frac{1}{2}$			70 feet $\frac{2}{18}$
		14 Inch $\frac{1}{4}$		50			68 feet
		21 Inches		48			147 feet $\frac{4}{18}$
		8 Inch $\frac{1}{4}$		26 $\frac{1}{2}$			19 feet $\frac{1}{18}$
		31 Inches		24			160 feet

In taking all the Dimensions in *Foot-measure* it's performed by the *Sliding-Rule* sooner than by *Inches*, thus count 10, 20, 30, 40, &c. on the *Girt-line* to be 1, 2, 3, 4, &c. in *Foot-measure*, and then place 10 on the *Girt-line D*, to the Length of the Tree, on the *Double-line C* ; then against the Girt in *Foot-measure* on the *Girt-line D*, standeth the *Content* on the *Double-line C*.

1. *Example*, before mentioned. A Tree in Length 31 Feet, and Girt 64 Inches, or Feet $5\frac{3}{8}$ it's fourth is Foot $1\frac{3}{8}$, what's the *Content* ?

C 4

Set

Set 10 on the *Girt-line* D, to 31 Feet on the *Double-line* C; then against 1 Foot 33 parts, on the *Girt-line* D, is 55 Feet on the *Double-line* C, which is the Content as before.

2. A piece of Timber 15 Feet long, and one fourth of the Girt 42 Inches, or Feet $3\frac{1}{4}$, what's the Content?

Set 10 on the *Girt-line* D, to 15 on the first part of the *Double-line* C, then against 3 Feet 5 Tenths, on the *Girt-line* D, is 184 Feet on the *Double-line* C, the Content required. Again,

3. A Length is $9\frac{1}{4}$ Feet or 9 Feet, $\frac{75}{100}$, and one fourth of the Girt 39 Inches, or 3 Feet $\frac{25}{100}$: Set 10 on the *Girt-line*, to $9\frac{75}{100}$ on the *Double line* C, and against $3\frac{25}{100}$ on the *Girt-line* D, is beyond 100 on the *Double-line* C: In such Cases take half the Length, and then the Content must be doubled. As here.

Set 10 on the *Girt-line*, to $4\frac{87}{100}$ the (half of $9\frac{75}{100}$) and then against $3\frac{25}{100}$ is $51\frac{1}{10}$, the double is 103 Feet, the Content required.

4. The Length 9 Inches or $\frac{75}{100}$ of a Foot, the Quarter of the Girt 35 Inches or 2 Feet $\frac{22}{100}$, set 10 on the *Girt-line*, to $\frac{75}{100}$ in the *Double-line* C, and against 2 Feet $\frac{22}{100}$ in the *Girt-line*, is 6 Feet $\frac{4}{10}$ on the *Double-line* C, the Content required. Again,

5. A *Rail* 16 Feet long, the Quarter of the Girt 3 Inches, or $\frac{2\frac{1}{2}}{100}$ of a Foot, what's the Content ?

Set 10 on the Girt-line, to 16 in the Double-line, then against $\frac{2\frac{1}{2}}{100}$ in the Girt-line, is one Foot, the Content on the Double-Line C.

And in like manner may all the *Examples* aforegoing, be wrought by the *Sliding-Rule*, if you take the fourth of the Girt in *Foot-measure*; for 11 Inches count $\frac{2\frac{2}{3}}{100}$, for 16 Inches count $1\frac{3\frac{3}{4}}{100}$, for 14 Inches count $1\frac{1\frac{7}{8}}{100}$, for 21 Inches count $1\frac{7\frac{1}{2}}{100}$, for $8\frac{1}{2}$ Inches count $\frac{7\frac{3}{4}}{100}$, and for 31 Inches count $2\frac{1\frac{1}{2}}{100}$, and so for the Length $40\frac{1}{2}$ Feet is $40\frac{1}{100}$, and so on for any other, which may be seen by the Table of *Foot-measure*, or by the Line of *Foot-measure* on the *Sliding-Rule*.

If it be required to find the Content of any piece of Timber in Loads, at 40 Feet the Load, use half the Girt instead of the whole.

Example.

A Length is 15 Feet, and a Quarter of the Girt is 42 Inches; set 12 on the Girt-line D, to 15 on the first Length of the *Double-scale* C, then against 21, (which is half of 42 one Quarter of the Girt) on the Girt-line D, is 46 on the *Double-scale* C, whereof 4 is 4 Loads, and the 6 multiplied by 4, makes 23 Feet

Feet which is 4 Load 24 Feet, or 4 Loads $1\frac{6}{8}$.

If at any time you have the Content in Loads, and you would have it in Feet ; 'tis but multiplying the Content found in Loads by 4, the Square of 2, by which you divided your Girt. So 46 multiplied by 4, is 184 Feet.

If you take the Dimensions in *Foot-measure*, you may find the Loads contained in any Timber, thus. If a Length be 15 Feet, and quarter of the Girt 42 Inches, that is 3 Feet $\frac{3}{8}$ whose half is 1 Foot $\frac{7}{16}$, then set 10 on the Girt-line D, to the Length 15 on the Double-line C, then against $1\frac{7}{16}$ (the half of $3\frac{3}{8}$ one quarter of the Girt) on the Girt-line is $4\frac{6}{10}$ on the Double-line C, which is 4 Loads $\frac{6}{10}$, or 4 Loads 24 Feet, the Content required.

If at any time you would know the Content of any piece of Timber by Natural Arithmetick ; having girt your Tree, and taken one fourth part for the side of the Square, observe the following *Rule*.

Multiply the Length of the side of the Square in Inches into it self, and that produced by the Length in Feet, and the last Product divide by 144, the Quotient is the Content in Feet, and if any thing remain, divide again by 12, the Quotient is the odd Inches.

So in Example the Second.

A Piece of *Timber* is 15 Feet long, the quarter of the Girt is 42 Inches, what is the Content of the Tree?

The side of the Square ——— 42 Inches
Multiplied by it self ——— 42

84
168

The product is Inches ——— 1764
Multiplied by the Length ——— 15 feet

8820
1764 (feet inc.
144) 26460 183.9
144 ..
1206
1152
00540
432
12) 108(9 Inch,
108

Content is 183 Feet 9 Inches — 000

But by *Decimal Arithmetick*, taking all the Dimensions in *Foot-measure*, it's much shorter, as follows by the foresaid *Example*.

Side

	F. Par.
Side of the Square 42 Inch. in <i>Foot-measure</i>	3.5
Multiply it by it's self —————	3.5
	175
	105
The Product is —————	Feet 12.25
Multiply it by it's Length ———	Feet —15
	6125
	1225
Last Product is the <i>Content</i> in <i>Feet</i> ———	183.75
That is 183 <i>Feet</i> $\frac{75}{100}$, or 9 Inches as before.	

C H A P. VII.

Of the Measuring of Round Timber or Trees, the true Way by the Sliding-Rule and Arithmetically.

THE last Way is the common Way of measuring *Round Timber*, but it giveth not the true Content, for it is always too little, (though it be generally used :) I shall now give you a Point on the *Rule*, which must be used instead of 12 ; which Point you may cut with a sharp Pointed Penknife at 10.635, but much better by the *Instrument-maker*.

So in the second Example foregoing.

Let the Length be 15 Feet, the one fourth of the Girt is 42 Inches : Set the said Point (which is 10.635 the true point) to 15 the Length

Length, then against 42, at the Beginning of the Girt-line, is 233 Feet on the Double-scale for the Content ; whereas the common Way giveth but 184 Feet.

Note, That the common Measure is to the true Measure, as 11 is to 14 ; so that if you set 11 on the *Double-scale* to the Content found the common Way, 14 shall point out the true Content of the same ; and if you set 14 to any true Content, 11 shall point out the Content the common Way ; this is done on the *Double-line*.

The Girt being taken in *Foot-measure*, the point for true Measuring is 8862 or $\frac{8862}{10000}$ or more briefly $\frac{88}{1000}$, and then for the foregoing *Example*.

The Length being 15 Feet, the one fourth of the Girt 42 Inches ; that is, 3 Feet $\frac{3}{8}$ or Feet 3.5 Tenths. I demand the true Content.

Set the aforesaid Point $\frac{88}{1000}$, on the *Girt-line* D, to the Length 15 Feet on the *Double-line* C, (in it's first Part or Beginning) ; then against Feet 3.5 Tenths (which is 35) on the *Girt-line* D, is 233 Feet on the *Double-line* C, which is the true Content required. Again,

Suppose a round Tree in Length 31 Feet, and one Quarter of it's Girt 16 Inches, that is 1 Foot $\frac{3}{4}$, or Foot 1.33 Parts ; what's the true Content ?

Set 89 on the *Girt-line* D, to 31 Feet on the *Double-line* C, then 1.33 on the *Girt-line* D, points to 70 Feet on the *Double-line* C, the true Content required ; whereas by the first *Example* of *Chapter* the 6th, the Content of this Tree is but 55 Feet, by the common way of Measuring, which is no less than 16 Feet short of the Truth.

I shall next shew how to find the true *Content* of *Timber*, *Arithmetically*, as followeth.

By a *Fixed Number* or *Decimal*, .2821, which multiply by the Girt of the Tree taken in Inches, and from the Product cut off four Figures to the Right-hand, the remaining to the Left-hand, are the Inches for the side of the Square equal to the Girt or Circumference of the Tree.

And for understanding it, take these two or three Examples, how to find the side of the Square that shall be equal to the Girt or Circumference of the Tree, by this *Fixt Number* .2821, always to be used ; when the Girt is Inches

This *Decimal*, or *Fixt Number* is .2821
The Girt in the 2d *Example* is ——— 168 Inc.

$$\begin{array}{r} 22568 \\ 16926 \\ 2821 \end{array}$$

The Product is ——— Inches 47.3928

Here

Here the side of a Square equal to that *Girt* is 47 Inches and a quarter ; for these four Decimals cut off, are so many parts of 10000, and .3928 is almost $\frac{4}{10}$ of a Foot, which is more than a quarter of an Inch.

Another Example.

The fixt Number is .2821

The Girt is _____ 48 Inches

22568

The side of a Square equal— 11284

To this Girt is $13\frac{1}{2}$ Inc. or Inc. 13.5408

Another Example.

The fixt Number is .282 r

The Girth is _____ 54 Inches

11284

The side of a Square equal— 14105

To this Girt is $15\frac{1}{4}$ Inc. or Inc. 15.2334

I now proceed to work the foregoing piece
of Timber or Tree

Arithmetically.

Multiply the Inches of the Square (with the first Left-hand Figure of the four which is cut off) into its self, and that Product by the Length in Feet, and divide the last Product by 144, the Quotient is Feet, and the Remainder, if any, divide by 12, the Quotient is Inches.

I

Exam-

(48)

Example.

F. Par.

The side of the Square in Inches—47.3

Multiply by it self ————— 47.3

1419

3311

1892

In the Product cut off 2 Decim. 2237.29 Pt.

The Length in Feet ————— 15

11185

2237

F. I.

144)33555(233.3

288..

0475

432

0+35

432

The Content of this Timber } ———

is 233 Feet 3 Inches ——— } — 003 Inch.

Another Example for Practice.

There is a round Tree, whose Girt is 48 Inches, and the Length 8 Feet 9 Inches, what is the Content ?

Multiply the Inches of the side of the Square equal to the Girt with the first Figure on the Left-hand of the four cut off) into it self, and from the Product cut off two Figures to the Right-hand, the Remainder multiply by the Inches of the Length of the Tree (and not by the Length in Feet) because the Length is Feet and



and Inches, therefore you must bring your Length into Inches by multiplying them by 12; this last Product divide by the Inches that are in a Square Foot of Timber, namely 1728, the Quotient is the Feet, the Remainder (if any) divide by 144, the Quotient is the odd Inches.

Example.

The Side of the Square being Inches—13.5
Multiply it by it self ————— 13.5

F.In. 675

The Length—8.9 405

Multiplied by —12 135

Makes—105 Inches —182.25

The Length in Inches is —105 In.

910

1820

The Content of this
round Tree is 11 Feet
and 102 remains, which
is not one Inch.

1728)19110(11 Ft.

1728

01830

1728

0102

Note, The fix'd Number .2821 is the side of a Square, that's equal to a Circle whose Girt is 1 Inch, 1 Foot, or 1 any Thing.

Also the Number 10.635, is the side of a Square that's equal to a Circle whose Diameter is 12 Inches.

D

Also

Also .8862, (or shorter .89) is the side of a Square that's equal to a Circle whose Diameter is 1 Foot, or 1 any Thing.

Now to perform this Arithmetically, when all the Dimensions are taken in Foot-measure.

The *Rule*. Multiply the whole Girt by the Fix'd Number .2821, and the Product is the side of a Square equal to that Girt; then multiply that Product by it self, and this last Product multiply by the Length of the Tree, and it produceth the Content required.

Example. Let the Length be 15 Feet, and the Girt 14 Feet. I demand the true Content? The fix'd Number is ————— .2821
Multiply by the Girt 14 Feet, inverted is —41

2821

1128

The Product is the side of the Square Ft. 3.949
Multiply by it self, inverted is ————— 949.3

11.847

3546

156

27

The Product is the Square ————— Feet 15.576
Multiply by the Length 15 Feet, inverted —51

15.576

7785

The Product is the Content ————— Feet 233.61
That is 233 Feet $\frac{61}{100}$ or 233 Feet 7 Inches.

Another

Another Example for Practice.

A round Tree, whose Girt is 48 Inches, or 4 Feet, and Length 8 Ft. 9 Inc. or 8 Ft. $7\frac{3}{4}$.

The fix'd Number is ————— .282

Multiply by the Girt 4 Feet ————— 4

Product is the side of the Square — Foot 1.128

Multiply by it self, inverted is ————— 8.211

1128

112

22

8

The Product is the Square, ————— Foot 1.270

Multiply by the Length 8.75, inverted is 5.78

10160

889

60

The Product is the Content ————— Feet 11.109

C H A P. VIII.

To measure the CUBE.

LET there be a Cube whose Sides are 3 Feet 3 Inches, what is the Content?

By the Sliding Rule.

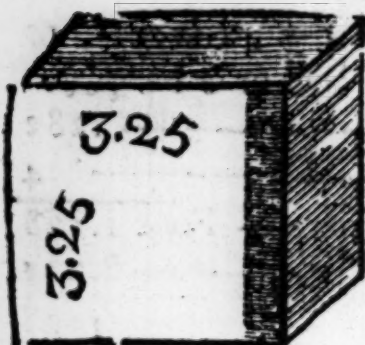
Set 12 on the Girt-line D, to $3\frac{3}{4}$ on the Double-scale C; then against 39 Inches the side of the Cube on the Girt-line D, is 34 Feet and $\frac{1}{4}$ on the Double-scale C, the Content required.

D 2

De.

(52)

Decimally.



F.Par.

The side 3 ft. 3 in. or 3.25
Multipl. by the same 3.25

1625

650

975

The 1st Prod. is 10.5625
Multipl. by the same 3.25

528125

211250

316875

The Content is $34 \frac{1}{3}$ Feet or—Feet 34.328125

But by Contraction thus,

F.Par.

The side of the Cube 3 Feet 3 Inches or —3.25
Multiply by 3 Feet 25 Parts, inverted is—52.3

975

65

16

The first Product called the Square, is Ft. 1056
Multiply by 3 Feet 25 Parts, inverted is—52.3

3168

211

53

The Content $34 \frac{1}{3}$ Feet as before,—Ft. 34.32

CHAP.

C H A P. IX.

To measure Timber that is neither Round, nor Square ; but first to find a Mean Proportional between any two Numbers.

TO find this *Mean Proportional*, set the greater of the two Numbers on the Girt-line, to the same on the Double-line of Numbers ; then against the lesser on the Double-line of Numbers, is the Mean Proportional on the Girt-line ; or set the lesser on the Girt-line, to the same on the Double-line of Numbers ; then against the greater on the Double-line of Numbers, is the Mean Proportional on the Girt-line ; any one of these will do.

Note, Examples of this are in the next *Problem*.

P R O B. I.

To measure unequal squared Timber, that is, when the Breadth and Depth are not equal.

Measure the Length of the Piece in Feet, and the Breadth and Depth, (at the End) in Inches. Then find the Mean Proportional between the Breadth and Depth of the Piece as is taught above, and in the Example following. The Mean Proportional is the side of a Square equal to the End of the Piece ; which having found, the Piece may be measured as Square Timber.

Example I.

In a piece of Timber whose Length is 13 Feet, the Breadth 23 Inches, and the Depth 13 Inches ; set 23 on the Girt-line D, to 23 on the Double-scale C ; then against 13 on the Line C is 17.35, or $17\frac{1}{3}$ on the Girt-line D, then setting 12 on the Girt-line D, to 13 Feet the Length on the Line of Numbers C, then against $17\frac{1}{3}$ (the mean Proportion) on the Girt-line D, is 27 Feet the Content required.

Example. II.

In Stone, which let it be 7 Feet 40 Parts, or 7 Feet and about 5 Inches in Length, and 30 Inches in Breadth, and $23\frac{1}{2}$ deep ; set 30 Inches on the Girt-line D, to 30 on the Double-scale C ; then against $23\frac{1}{2}$ on the Line of Numbers C, is $26\frac{1}{2}$, or 26.50 on the Girt-line D : Then set 12 on the Girt-line D, to 7.40, on the Line C, then against $26\frac{1}{2}$ on the Girt-line D, is 36 Feet the Content on the Double-scale C.

The Content of these two Examples by Arithmetick, is thus,

The first Example.

Let there be a piece of Timber whose Length is 13 Feet, the Breadth 23 Inches, and the Depth 13 Inches.

The

The Rule.

Multiply the Breadth in Inches, by the Depth in Inches; and that Product multiply by the Length in Feet, and divide the last Product by 144, the Quotient is Feet, and the Remainder (if any) divide by 12, the Quotient is Inches.

Example.

The Breadth 23 Inches.

The Depth—13 Inches.

$$\begin{array}{r} 69 \\ 23 \\ \hline \text{The Product } 299 \\ \text{Multiply by } 13 \text{ Ft.} \\ \hline 897 \\ 299 \\ \hline 144 \overline{) 3887} (26 \text{ Ft. } \frac{1}{2} \text{ of an Inch.} \\ 288 \end{array}$$

Note, This Example by the

Sliding Rule was 27 Feet, but by Arithmetick it wants something; for it is 26 Feet 11 Inches, and

$\frac{1}{2}$ of an Inch.

288

1007

864

12) 143, 11 Inches

12

023

12

Remainder is 11 of an Inch.

By Foot-measure it's done thus :

	F. Par.
Breadth 23 Inches in Foot-measure is —	1.92
Depth 13 Inches or Feet 1.08, inverted is 80.1	1.92
	15
The Product is ————— Feet —	2.07
Multiply by the Length 13 Feet, inverted is 31	207
	62
Content is 26 Feet 11 Inches, or Feet —	26.9

The Second Example, Decimally.

Let there be a piece of Stone 7 Feet 40 Parts long, 2 Feet 50 Parts in Breadth, and 1 Foot 96 Parts in Depth, what is the Content ?

The Rule.

Multiply the Length by the Breadth, and the Product by the Depth or Thickness ; and cut off from the last Product, as many places to the Right-hand as there be Decimals in the three Dimensions, the Integers remaining are Feet.

Example

Example:

F. Par.

The Length ----- 7.40

The Breadth _____ 2.50

37000

1480

The Prod. Feet 18,5000

The Depth Ft. 1.96.

000011

1665

185

The Content is 36 Ft. 3 Inc. or Ft. 36.260000

By Foot-measure it's thus Contracted.

F. Par.

The Stones Length 7 Feet 5 Inches, that is 7.41

Stones Breadth 30 Inches or 2.5, inverted is 5.2

1482

370

The Product is _____ Feet 18.52

Depth $23 \frac{1}{2}$ Inches, or 1.96, inverted is— 69.

1852

1667

III

The Content is 36 Feet 4 Inches, or Feet 36.30

PROB.



II.

To find the ~~Content~~ of a piece of Timber whose End is in the Form of a Triangle; and both Ends alike and equal.

TO find the Content of such Timber, first find a mean Proportional between the Base and half the Perpendicular (of the Triangular End) or between the Perpendicular and half the Base, both measured in Inches, Then is the mean Proportional the side of a Square equal to the Triangle.

Then to find the Content, set 12 on the Girt-line D, to the Length in Feet on the *Line of Numbers C*, then against the mean Proportional on the Girt-line D, is the Content on the *Line of Numbers C*.

But the Dimensions being all taken in *Foot-measure*, and the mean Proportional found in the same; then set 1 on the Girt-line D, to the Length in the Double-line C; then against the mean Proportional on the Girt-line D, is the Content in the Double-line C.

Note, If the two sides of a Triangle be equal, the other side is called the Base, but if the three sides be unequal, the longest side is the Base: From whence the nearest Distance, to the opposite Angle, is the Perpendicular.

Exam-

Example. A piece Timber 19 Feet 6 Inches in Length, the Base of the Triangle at each End being 21 Inches, and the Perpendicular to each Base being 16 Inches, what's the Content?

Set 21 Inches on the Girt-line D, to 21 on the Double-line C; then against 8 on the Line C, is $12\frac{2}{3}$, or 12.95 on the Girt-line D, the Mean Proportional.

Then set 12 on the Girt-line D, to $19\frac{1}{2}$ Feet the Length on the Double-line C; and against 12.95 (the Mean Proportional) on the Girt-line D, is $22\frac{1}{4}$ or Feet $22\frac{1}{8}$ the Content required) on the Double-line C. Or thus, take all the Dimensions in Foot-measure, and then the Length 19 Feet 6 Inches is 19.5, the Base 21 Inches is 1.75, and the Perpendicular 16 Inches is 1.33; now set 1.75 on the Girt-line D, to 1.75 on the Double-line C, and against 0.67 on the Double-line C, is 1.08 on the Girt-line D, for the Mean Proportional; Then set 1 on the Girt-line D, to the Length 19.5 on the Double-line C, and against 1.08 on the Girt-line D, is 22.8 (or Feet 22 almost 11 Inches) on the Double-line C, for the Content, very near to that before,

Arithmetically.

The Rule; multiply the Base by the Perpendicular (both taken in Foot-measure) and half that Product multiply'd by the Length,

Length, produceth the Content required, as in the foresaid Example.

F.Par.

The Base 21 Inch. or in Foot-measure is—1.75

The Perpendicular 16 Inch. or 1.33, inver. 33.

175

53

The Product is ————— Feet 2.33

Half the Product is ————— Feet 1.17

The Length 19 Ft. 6 Inch. 19.5, inver.—5.9

117

105

The Content is 22 Feet 10 Inches, or Ft. 22.

P R O B. III. *To measure Timber that Tapers.*

MEasure the Length in Feet, and note one third of the Length, which may be found by the *Sliding-Rule*, thus; Set 3 on the Double-line A, to the Length on the Double-line B; then against 1 on the Double-line A, is the third part on the Double-line B; then if the Solid be round, Measure the Diameter at each End in Inches, subtracting the lesser Diameter from the greater, and add half the Difference to the lesser Diameter, the Sum is the Diameter in the middle of the Piece.

Piece; then set 13.54 on the Girt-line D, to the Length on the Double-line C, then against the Diameter in the middle on the Girt-line D, is a fourth Number on the Double-line C, then set 13.54 or $13\frac{1}{4}$, of the Girt-line D, to the third part of the Length on the Double-line C; then against the half Difference on the Girt-line D, is another fourth Number on the Double-line C, these two fourth Numbers added together give the Content.

Example. Let the Length be 27 Feet (the one third by the Rule is 9) the greater Diameter 22 Inches, and the lesser 18 Inches.

See the Operation.

The greater	_____	22 Inches
The lesser Diameter	_____	18 Inches
The Sum is	_____	40
The Difference	_____	64
The half Difference	_____	02
The lesser Diameter	_____	18
		} added
The Diameter in the middle	_____	20 Inches

Then set 13.54, or $13\frac{1}{4}$ on the Girt-line D, to 27 on the Double-line C; then against 20 on the Girt-line D, is 58.900, that is 58 Feet $\frac{900}{1000}$ parts.

Again, set 13.54 on the Girt-line D, to 9 on the Double-line C; then against 2 on the Girt-line (represented by 20) is 196 Parts of a Foot.

The

{	The first fourth Number ———	58.900	}	added
	The second fourth Number ———	196		
	The Sum is the Content ———	59.096		

Which is 59 Feet $\frac{1}{4}$ Inch.

Note, If the Timber be wainy, that is, neither Square nor Round, take one Wain in and leave the other out.

The same done by *Foot-measure.*

	F. Part
The greater Diameter 22 Inches, or ———	1.83
The lesser Diameter 18 Inches, or ———	1.5
The Sum of both Diameters is ———	Foot 3.33
Half is the middle Diameter ———	Foot 1.67
Difference of the Diameter is ———	Foot 0.33
Half Difference of the Diameter is Feet —	0.17

Then set 1.13 on the Girt-line D, to the Length 27 Feet on the Double-line C; and then against 1.67 on the Girt-line D is 58.9 Feet $\frac{2}{3}$. Then,

Set 1.13 on the Girt-line D, to 9 Feet, on the Double-line C; and then against 0.17 on the Girt-line D, is .196 Parts of a Foot, and both put together is the Content; that is, 58.9 and .196 added makes 59.096, or 59 Feet $\frac{1}{4}$ Inch, as before.

Suppose the Solid be Square, and having the same Dimensions; that is Length 27 Feet, the Greater End 22 Inches Square, and the Lesser End 18-Inches Square, what's the Content?

F. Part

F. Part

The greater Square	22—Inches or	1.83
The lesser Square	18—Inches or	1.5
Sum of both Squares	40—Inches or	3.33
$\frac{1}{2}$ is the mid. Square	20—Inches or	1.67
Differ. of the Ends	4—Inches or	0.33
$\frac{1}{3}$ Differ. of the Ends	2—Inches or	0.167

Then to find the Content by the Inch-measure it's thus. Set 12 on the Girt-line D, to 27 Feet (the Length of the Solid) on the Double-line C; then against 20 Inches (the middle Square) on the Girt-line D, is 75 Feet $\frac{4}{10}$. Again, set 12 on the Girt-line to 9 Feet (one third of the Length) on the Double-line; and against 2 Inches the half Difference of the Ends) on the Girt-line, is $\frac{25}{100}$ parts of a Foot; both together is 75 $\frac{65}{100}$ parts (which is almost 8 Inches) the Content of the Solid: Or thus, by Foot-measure.

Set 1 on the Girt-line, to the Length 27 Feet on the Double-line, then against 1 Foot 67 Parts (the Middle Square) on the Girt-line, stands 75 Feet $\frac{4}{10}$, and setting 1 on the Girt-line, to 9 Feet (the one Third of the Length) on the Double-line; then against 0.167 (the half Difference of the Ends) on the Girt-line, is (on the Double-line) $\frac{25}{100}$ Parts of a Foot, and both together

ther 75 Feet $\frac{4}{18}$, and $\frac{21}{18}$ is 75 Feet $\frac{64}{18}$ part of a Foot as before, exactly agreeing both by Inch-measure and Foot measure; and here note the Numbers that are fix'd in this kind are thus to be understood: 13.54057, &c. in short 13.54 is the Diameter of a Circle, whose Area or Content is 144 Square Inches: And 1.1283814, &c. in short 1.12 is the Diameter of a Circle whose Area or Content is 1 Foot, or 1 any thing.

P R O B. IV.

To find how many Inches in Length will make a Foot Solid at any Girt, being the side of a Square, not exceeding 40 Inches.

LET the Girt or Side of the Square upon the Girt-line be set to 1 on the Numbers, then against 41.57 of the Girt-line is the Number of Inches on the Numbers that will make a Solid Foot.

Example.

Let the Side of a Square be 7 Inches, set 7 on the Girt-line D, to 1 on the Double-line C, then against 41.57 on the Girt line D, is 35 Inches on the Double-line C, for the Length of 1 Foot Solid.

To do the same in *Foot-measure*; the side of the Square 7 Inches, in *Foot-measure* is .58 parts; which said .58 parts on the Girt-line D, being set to 1, on the Double-line C

then

then against 1 on the *Girt-line D*, is 294, that is 2 Feet 94 parts, or 2 Feet $11\frac{1}{2}$ Inches for the Length, to make one Foot of Timber.

P R O B. V.

Having the Diameter of a Circle, or Round Piece of Timber; to find the Side of a Square within the Circle, or to know how many Inches the Side of the Square will be when the Round Timber is squared.

The Rule.

Set always 8.5 on the *Double-line A*, to 6 on the *Double-line B*; then against the Diameter on the Line A, is the Side of the Square on the Line B.

Example.

Let the Diameter be 18 Inches; set 8.5 on A, to 6 on B; then against 18 on A, is $12\frac{1}{2}$ on the Line B, for the Side of a Square within that Circle.

The same done in *Foot-measure*, the Diameter being 18 Inches is in *Foot-measure* 1.5; Then set 1 on the *Double-line A*, always to .707 or .71 almost, on the *Double-line B*; then against the Diameter 1.5 on the *Double-line A*, is 1.7 on the *Double-line B*; that is Foot 1.7 Tenths the side of a Square within a Circle, whose Diameter is Foot 1.5 Tenths. And here note the given Numbers 8.5, and 6 (but more truly 1, and .707) are, one the Diameter

ter of a Circle, the other the side of a Square within that Circle.

P R O B. VI.

By having the Girt of a Tree, or round Piece of Timber, to find the Side of a Square within.

The Rule.

Set 10 to 9 on the Line A and B, then against the *Girt* on the Line A, is the Inches for the side of the Square on the Line B.

Example.

Let the Girt be 16 Inches, Set 10 on the Line A, to 9 on the Line B; then against 16 on the Line A, is $14\frac{1}{4}$ on the Line B, for the side of the Square.

By *Foot measure* it's thus: the Girt 16 Inches, is Foot 1.33 parts; then set 10 on the *Double-line* A, to 9 on the *Double-line* B, and against the Girt 1.33 on the *Double-line* A, is on the *Double-line* B, 1.19; that is 1 Foot 19 Parts, which is 1 Foot $2\frac{1}{4}$ Inches, for the side of the Square within.

And *Note*, the Numbers 10 and 9, or 1 and 9, shews when the Square within the Circle is 1, the fourth part of the Circumference $1\frac{2}{5}$ parts of the same.

By

By these two last Problems you may know (before a piece of Timber is hewn) how many Boards or Planks of any Thickness it will make.

P R O B, VII.

By the fourth part of the Girt of Round Timber, to find the side of a Square equal to it.

The Rule.

Set 1 on the Line A, to 1.128 on the Line B; then against the (one fourth of the whole) Girt on the Line A, is on the Line B, the side of the Square equal to it?

Example. Let the Girt (that is the one fourth of the whole Girt) be 16 Inches; how much is the side of the Square equal to it?

Set 1 to 1.128, but shorter to 1.13, on the Lines A and B; then against 16 on the Line A, is 18 on the Line B; which sheweth that a Square whose side is 18 Inches, is equal to a Circle whose Girt is 64 Inches, or one fourth of its Girt is 16 Inches.

By *Foot-measure*, the *Rule* being set as before, 1 against 1.13, then against Foot 1.33 parts (equal to 16 Inches) you will find 1.5, that is 1 Foot $\frac{1}{2}$, equal to 1 Foot 6 Inches, the side of a Square equal to the given Girt, the same as before.

C H A P. X.

To measure Brick-Work.

Brick-Work is measured by the Rod of 16 Feet and a half, whose Square is $272\frac{1}{4}$, which sheweth that the Point on the Double-line is $272\frac{1}{4}$, but 272 being marked on the Rule will serve (without any considerable Error) a Brick and a half thick, and is the fixed Number.

An Example.

There is a Brick-wall whose Length is 564 Feet, the Height is 10 Feet and $\frac{1}{2}$: Set 272 on the Double-line A, to 564 on the Line B; then against $10\frac{1}{2}$ on the Line A, is $21\frac{7}{8}$ Rod, the Content on the Double-line B.

Note 1. Always the Fix'd Number that goeth with the Question is called the first Number, which you may set to either of the other Numbers.

Note 2. That $272\frac{1}{4}$ Feet makes a Rod of Brick-work, at a Brick and a half Thickness; if it be thicker fewer Feet go to a Rod; if thinner the more.

If you demand how many Feet makes a Rod at two Bricks Thickness: Two being the first or fix'd Number that goeth with the Question must be set to $1\frac{1}{2}$; then against $272\frac{1}{4}$ is about, 204, viz. 204 Feet $\frac{1}{8}$, and so for any other Thickness, for which

Take

Take this General Rule.

Set $1\frac{1}{2}$ to any Thickness; then against 272 $\frac{1}{2}$ on the second *Length* is the Number of *Feet* that makes a *Rod* to that Thickness, and is called First Number for that Thickness, as in the *Table* following.

By this *Table*, made by the same *Rule*, by the *half Brick's* Thickness of the Wall, you have the first *Number* by Inspection: as thus, against 2 *Bricks* $\frac{1}{2}$ or 3 half *Bricks* thick, is 163 *Feet*, for a *Square Rod*, and so for any other.

Half Bricks thick.		Square Feet in a Rod on the Superficies.	Half Bricks thick.		Square Feet in a Rod on the Superficies.
$\frac{1}{2}$.	1	817 Feet	3 $\frac{1}{2}$.	7	117 Feet
1.	2	408 Feet	4.	8	102 Feet
$\frac{3}{2}$.	3	272 Feet	4 $\frac{1}{2}$.	9	91 Feet
2.	4	204 Feet	5.	10	82 Feet
$\frac{5}{2}$.	5	163 Feet	5 $\frac{1}{2}$.	11	74 Feet
3.	6	136 Feet	6.	12	68 Feet

C H A P. IX.

Measuring of LAND.

L A N D is usually measured by the *Pole*, *Perch* or *Rod*, which is $16\frac{1}{2}$ *Feet* long; 40 *Poles* in Length and 4 in Breadth makes an *Acre*, so that an *Acre* of *Land* contains 160 *square Poles*, half an *Acre* is 80, and a quarter is 40.

Some use a *Pole-Chain*, and others a 4 *Pole Chain*, the best for Use is that of 4 *Poles*. This *Chain* is called *GUNTER's Chain*. It is divided into 100 Links or Parts, every Link is 7 Inches and 92 Parts of an Inch in Length.

P R O B. I.

By the Pole-Chain.

There is a Plot of Ground 35 Pole or Perch broad, and 185 Pole long, how many Acres is tent?

By the Sliding Rule.

Thus, Set 160 to the Breadth, then against the Length is the Content.

Example.

Set 160 on the *Double-line A*, to 35 the Breadth on the *Double-line B*; then against 185, the Length on the Line *A*, is $40\frac{46}{80}$ (that is 40 Acres and almost $\frac{1}{2}$) on the *Double-line B*; the Content.

Arithmetically.

The Rule. Multiply the Length in Poles by the Breadth in Poles, and divide the Product by 160 (the Poles in an Acre) the Quotient is the Acres, if any remains divide again,

By $\left\{ \begin{array}{l} 120 \\ 18 \\ 40 \end{array} \right\}$ the Quotient is $\left\{ \begin{array}{l} \frac{3}{4} \\ \frac{1}{2} \\ \frac{1}{4} \end{array} \right\}$ of an Acre.

Example

Example.

The Length ————— 185 Poles

The Breadth ————— 35 Poles

925

But 75 Poles remaining after the first Division, viz. by 160, which 75 being divided by 40 the last Remainder is 35, which makes the Content 40 Acres 1 Quarter and 35 Poles, or almost 40 Acres and $\frac{1}{2}$.

555
16|0)647|5(40 Acr.
64

4|0)007|5(1 quar.
4

35 Poles
(remaining.)

More Examples by the Rule.

Breadth $\left\{ \begin{array}{l} 42 \\ 53 \\ 64 \end{array} \right\}$ Pole. $\left\{ \begin{array}{l} \text{Length} \left\{ \begin{array}{l} 49 \\ 64 \\ 85 \end{array} \right\}$ Pole. $\left\{ \begin{array}{l} 12 \text{ Acres } 1\frac{86}{100} \text{ or } 12\frac{3}{4}. \\ 21 \text{ Acres } 1\frac{20}{100} \text{ or } 21\frac{1}{5}. \\ 34 \text{ Acres just.} \end{array} \right\}$

P R O B. II.

By the four Pole Chain. There is a Plot of Ground containing 16 Chains 25 Links in Breadth, and 57 Chains 30 Links in Length, what is the Content of that Piece of Land?

By the Sliding Rule.

The Rule. Set 10 on the Double-line, to the Breadth in Chains and Links on the other, then against the Length in Chains and Links is the Content?

Example.

Set 10 on the *Double-line A*, to 16.25 on the *Double-line B*, then against 57.30 on the *Double-line A*, is 93 Acres and something more, for the Content on the *Double-line B*.

Arithmetically.

Length — Chains 57.30 Links

Breadth — Chains 16.25 Links



28650

11460

34380

5730

Acres 93.11250 cut off five Figures

no Roods — $\frac{4}{45000}$
40

Poles — 18|00000

Note, 4 Roods make an Acre, and 40 Poles, Precbes or Rods makes one Rood or Quarter of an Acre.

More Examples by the Rule.

Breadth { 3.35 } Length { 15.32 } 5 Acr. a little more
 { 4.53 } { 16.42 } 7 $\frac{1}{2}$ Acres almost.
 { 16.28 } { 72.51 } 118 Acres.

Note, Gunter's Chain containeth four Statute Poles in 100 Links, so that any Number of Chains is no more than so many 100 Links; as 4 Chains is 400 Links, 6 Chains is 600 Links,

Links, &c. and 160 Square Statute Poles is an Acre, each Pole being 16 Foot and a half. Therefore in a square Chain is 16 square Poles. If you divide 160 (the square Poles in an Acre by 16 the (square Poles in a Chain) the Quotient is 10, the square Chains in an Acre.

A Square Chain contains 10000 Square Links (for it is 100 multiplied by 100) and consequently an Acre is 100000 Square Links.

Therefore the Reason of the foregoing Operation is evident, for if you multiply 5730 Links by 1625 Links, the Product will be 9311250 Square Links. Divide 9311250 by 100000 (the Square Links in an Acre) the Quotient is Acres, and the Remainder is Parts of an Acre. But to divide by 100000 is no more than to cut off five Figures to the Right-hand, so will the remaining Figures to the Left-hand be Acres, and those cut off to the Right-hand 11250, are parts of an Acre: Again, multiply those five Figures cut off from the Right-hand of the Product by 4, and from the Product cut off five Figures to the Right-hand, those on the Left-hand will be Roods, and if those cut off be multiplied by 40, and from the Product five Figures be cut off from the Right-hand, those on the Left-hand, are Poles or Perches.

So

So in the preceding Operation there is 93 Acres, no Roods, 18 Perches for the Content.

P R O B. III.

How to reduce Statute Measure to Customary, and the contrary.

A Ccording to a *Statute* made in the 33d of *Edward* the I. and likewise in the 25th of *Elizabeth*, a *Statute Pole* is 16 Feet and a half long. Now divers parts of *England* uses a Pole of 18 Feet long, and some a Pole of 21 Feet long, and others a Pole of 24 Feet long. Therefore to turn one sort of Measure into another; suppose *Statute* into *Customary*, do thus; multiply any Number of Acres, Roods and Perches *Statute Measure*, by the Square half Yards, or square half Feet, in a square Pole of *Statute Measure*, the Product divide by the square half Yards, or square half Feet in a Pole of the *Customary Measure*, the Quotient gives you the Acres, Roods and Perches of that *Customary-measure*; as for *Example*. In 172 Acres *Statute-measure*, how many Acres of 18 Feet to the Pole or Perch?

In a *Statute Pole* or Perch, there is five Yards and a half, that is 11 half Yards; consequently in a square *Statute Pole* there is 121 square half Yards, and in a square Pole of 18 Feet, there is 144 square half Yards.

172 Acres

(75)

172 Acres Statute Measure.

121 Square half Yards in a Statute Pole.

$$\begin{array}{r}
 172 \\
 \times 172 \\
 \hline
 344 \\
 172 \\
 \hline
 144) 20812 (144 \text{ Acres Customary and } \frac{26}{144} \\
 \underline{144} \\
 641 \\
 \underline{576} \\
 652 \\
 \underline{576} \\
 76 \text{ Overplus}
 \end{array}$$

Therefore the Customary Acres (at 18 Feet to a Perch) is 144 $\frac{26}{144}$ of an Acre, the Overplus multiply by 4, and the Product divide by 144 gives Roods; again, multiply the Remainder by 40, and the Product divide by 144, the Quotient will be Perches; as by the following Operation of the preceding Remainder.

76 Overplus, or Remainder.

$$\begin{array}{r}
 4 \\
 \hline
 144) 304 (2 \text{ Roods} \\
 \underline{288} \\
 16 \\
 \hline
 40 \\
 \hline
 144) 640 (4 \text{ Perches} \\
 \underline{576} \\
 64
 \end{array}$$

So

So that 172 Acres Statute Measure is 144 Acres, 2 Roods and 4 Perches, with a small Remainder (not worth notice) of *Customary Measure*, of 18 Feet to the Pole or Perch.

It there had been any given Roods and Perches with the Acres, then you must turn all into Perches, and having multiplied and divided as before directed, divide the Quotient by 160, or 40, and that Quotient again by 4.



P R O B.

P R O B. IV.

In 543 Customary Acres, at 18 Foot to the Perch, how many Acres of Statute-Measure?

543 Customary Acres.

144 square $\frac{1}{2}$ Yards in a customary Acre.

1272

2172

543

121)78192(646 Statute Acres.

726

0559

484

0752

726

26 Remainder, multiplied

by 4

104 no Roods

40

121)4160(34 Perches

363

530

484

046 Remains

Here

Here you see that in 543 Customary Acres at 18 Feet the Perch there are 646 Acres, no Roods, 34 Perches Statute Measure and $\frac{49}{111}$.

Customary Acres as well as Statute Acres, contain 160 Square Perches, the Difference is only in the bigness of the Perch.

C H A P. XII.

The Description and Construction of Scamozzi's Lines upon the Two Foot Rule, with their Use in all the necessary Problems preparatory to the Practice of Building.

1. **T**H E most useful Line of all is a Scale of equal Parts, beginning at 0 at the Center or Joint of the Rule, and proceeding to 30 near the remote end of it on both sides; at which on each Leg of the Rule there is a Brass Point or Center-Pin fix'd, and as these 30 Divisions are intended in general to represent 30 Foot, they are every one subdivided into 12 equal Parts, every one of which represents an Inch; but they may be applied to any other Measure.

2. Next to this, and above the 30 Scale is the 40 Scale, or the same Length divided into 40 equal Parts, and each into 6 Subdivisions, so that if the Divisions be Feet, the Subdivisions are each of them 2 Inches.

3. On

3. On the other Joint of the Rule, and next without the 30 Scale is a Line of Chords with a Center-Pin, at 60 equal to 15 on the 30 Line, and so proceeding to 180, where there is another Center-pin at the End of the Line.

4. Next to the Line of Chords is a Line of Tangents, beginning at 0, and continuing to the Tangent of 45, which is the Radius of every Circle.

5. The Vacancy left by the spreading of the 30 Scale is supply'd by the Line of *Polygons*, it begins at 2 at the remote End of the Scale, and reckons inwards in some Scales to 20; but it is now thought sufficient to continue it to 12, to prevent the Confusion upon the Scale which would otherwise be occasioned by the Contraction of the Lines, and the decreasing Distance of the Numbers towards the Center.

Before I give a further Account of the Use of *Scamozzi's* Lines, it will be proper to explain the Terms made use of in Buildings, so far as it relates to the Use of those Lines; as,

1. A Model or Module is the Diameter of a Pillar or Column, and a Minute is the 60th Part of a Model in any order; as suppose the Diameter of a Column or Pillar be 18 Inches, then 18 Inches is a Model, and 3 Tenths is a Minute: and hence, if a Column of 18 Inches Diameter be 7 Models, 12 Minutes, it's Height is 10 Foot 9 Inches, 6 Tenths.

2. In

2. In the Use of the Sector, or which is the same of Scamozzi's Lines which come to the Center or Joint of the Rule, the Word *Lateral* signifies an Extent taken from the Center of the Scale to the Number propos'd, set off upon either Limb of the 30 Scale as Lateral 17 is the Extent from the Joint or Center of the Rule to 17 on the 30 Scale on either Limb; but a Parallel Extent is from any Number upon one Limb to the same upon the other: Thus at whatever Opening the Rule is set, the Extent from 17 on one Limb to 17 on the other is called a Parallel Extent of 17, &c. The Proportion between the Lateral and Parallel Extents upon the Sector, and consequently upon Scamozzi's Lines are fully demonstrated, *Euclid Lib. VI. Prob. II. and IV* and upon that Foundation we may build the following general Rule, which is universally true in the Use of all Sectoral Lines, whether equally divided or not, viz.

That every Lateral is to its Parallel, as any other Lateral is to its Parallel; The Sector or Rule being kept at the same Extent or Opening: Therefore in all Proportions in Common Numbers to be performed by Scamozzi's 30 Scale; the Rule is this.

Make the Lateral Second Term a Parallel in the first, then shall Parallel Third Term be Lateral Fourth required.

Example.

Example. As 18 to 24, so 12 to what? Make Lateral 24 a Parallel in 18, then shall Parallel 12 be Lateral 16; the Answer, or to be more plain, extend the Compasses from the Center in the Joint of the Rule to the second Term 24, and keeping that Extent in the Compasses, open the *Sector* so as that Extent may reach from 18 on the 30 Scale on one Leg, to 18 on the 30 Scale on the other Leg of the Rule; then keeping the Rule at the same Opening, extend the Compasses from the Third Term 12, on one Limb of the Rule, to 12 on the other Limb, that extent apply'd from the Center or Joint of the Rule along the 30 Scale, will reach to 16 the Answer requir'd; and this being the Method of working all direct Proportions either in Lines or Numbers, I need not repeat Examples.

The Use of *Scamozzi's* Lines in several necessary Problems.

PROB. I. *To divide a Given Line less than two Foot into any Number of equal Parts, as suppose a Line of 7 Inches is to be divided into 17 equal Parts.*

TAKE 7 Inches in your Compasses and make it a Parallel in 17 upon the 30 Scale, then shall the Parallel of 10, 12, 15, &c. represent their respective Numbers of Parts upon the Line of 7 Inches proposed to

be divided. The Use of this is, if I would represent a Garden of 28 Yards square, upon a piece of Paper of 3 Inches square, take 3 Inches off the Scale and make it a Parallel in 28, and keeping the Scale at that Opening the Parallel of 5, 6, 10, &c. shall represent the same Number of Yards upon the Paper, or to any Number under 30; but if a Number above 30 be required to be laid down upon a Line of 7 Inches: As suppose 48, take the half of it, *viz.* 24; makes the given Line 7 Inches a Parallel in 24; then shall every Parallel represent its double, as the Parallel of 9 represents 18; and if the Line was to be continued beyond 48, the Method is the same, for the Parallel of 30 would be the Measure of 60, &c. and by this Means without a Multiplicity of Problems any Scale to any Draught may be made either to measure, or lay it down by.

P R O B. II. *To set the 30 Scale at any Angle proposed, or being set in any Position to know what Angle one 30 Line makes with the other; and first to set it at Right Angles, or a perfect Square.*

Make Lateral 90 of the Chords, a Parallel in 15 on the 30 Scale; then does the two 30 Scales make a Right Angle.

Or take 10 off the 30 Scale in your Compasses, and setting one Foot in 8, open the Rule

+

till

till the other Foot will fall in 6 on the same Scale, and then the two 30 Lines stand at Right Angles. *Euclid. Lib. 1. Prob. 47.* Or make Lateral 21 Foot 2 Inches a Parallel in 15, it produces the same.

To set the Rule to any Angle propos'd, as suppose of 50 Degrees, make Lateral 50 of the Chords a Parallel in 15 on the 30 Scale, and it is done; and to know what Angle the Rule lies open at in any Position, make Parallel 15 on the 30 Line a Lateral upon the Chords, and that gives the Angle requir'd.

P R O B. III. *To find a mean Proportional between any two Numbers given, or in plainer Terms, to find an Intermediate Number, whose Square is equal to the Product of the two given Extreams.*

Set the 30 Scale at Right Angles by *Prob. 2.* and take off the Lateral half Sum of the two given Numbers, and with this Extent, and one Foot in the Lateral half Difference of the two given Numbers, observe where the other Foot falls upon the 30 Scale on the other Leg of the Rule, for that is the mean Proportional required. Thus the mean Proportional between 4 and 16 is 8, because 4 times 16 is equal to the Square of 8, or as 4 to 8, so is 8 to 16.

Note, One Use of the mean Proportional, among many others [is, in measuring Solids, whose Breadth and Depth are not equal, for in that Case the mean Proportional between the Breadth and the Depth is equal to the side of the Square, and to be used as such in all Cases where the side of the Square is a Term used to find the Content.

P R O B. IV. *Of Superficial Measure, and first the Breadth of a Plank given, to find how much in Length makes a Foot.*

Make Lateral 12 a Parallel in the Breadth, and letting the Rule continue so, take off Parallel 12, and that apply'd laterally gives the Length of a Foot.

Example. At 9 Inches broad make Lateral 12 a Parallel in 9, then shall Parallel 12 be Lateral 16, the Length of a Foot requir'd.

2. *The Breadth of a Board given in Inches, and the Length in Feet, to find the Content in Feet.*

Make Lateral Length in Feet a Parallel in 12, then shall Parallel Breadth be Lateral Content in Feet.

Example. Breadth 8 Inches, Length 18 Feet, make Lateral 18 a Parallel in 12; then will Parallel 8 make Lateral 12 the Content in Feet.

P R O B.

PROB. V. *Of solid Measure for Timber ; and first at any Number of Inches square, to know how much in Length makes a Foot.*

N. B. *If a Piece of Timber be not square, make it a square by help of a mean Proportional, as in Prob. 3. and use that as if it was the side of the Square.*

Make Lateral side of the Square a Parallel in 12 (always) and keeping the Rule at that Opening makes Parallel side of the square a Lateral fourth Number. Again, make Lateral 12 a Parallel in that fourth Number, then will Parallel 12 be Laterally the Number of Inches to make a Foot.

Example. At 9 Inches square, how much in Length makes a Foot. Make Lateral 9 a Parallel in 12, then will Parallel 9 be Lateral $6\frac{1}{4}$. Again, make Lateral 12 a Parallel in $6\frac{1}{4}$, then will Parallel 12 be Lateral $21\frac{1}{3}$ Inches to make a Foot of Timber.

2. The side of the square in Inches, and the Length in Feet given, to find the Content in Feet and Inches.

Make Lateral side of the Square a Parallel in 12 (always) then is the Parallel Length a Lateral fourth Number — Again, make the Lateral fourth Number a Parallel in 12, then is Parallel side of the square the Lateral Content in Feet.

Ex. Suppose a piece of Timber be 20 Foot long, and 9 Inches square, make Lateral 9 a Parallel in 12, then is parallel 20 (the Length) a Lateral fourth Number, *viz.* 15. Then make Lateral 15 a Parallel in 12, then is Parallel 9 a Lateral 11 $\frac{1}{2}$ the Content in Feet required.



The Use of the foregoing Problems in Building, viz. in finding the Lengths and Angles of Rafter, Hips and Collar-Beams in any Square, or Bevelled Roof at any Pitch.

IN order to the better understanding the following Directions, it is necessary to observe, that *True Pitch* is when the Rafter is just three Quarters the Breadth of the Frame or House, and to find it readily seek the Breadth of the House upon the 40 Scale, and against it you will find on the 30 Scale the Length of the Rafter requir'd, three Quarters of which is (nearly) the height of the Perpendicular from the raising Piece to the Top of the Gable, which is found on the Rule by looking for the Length of the Rafter on the 40 Scale, and against it on the 30 Scale is the Perpendicular of the Gable requir'd.

Example

Example. Let the House be suppos'd 16 Feet broad, the Rafter according to this Proportion are to be 12 Feet long, and the Perpendicular will be 9 Feet.

Note, This Proportion is not exactly or mathematically true for making half the Breadth of the House which is 8, the Base of a Right-angled Triangle; the Length of the Rafter 12, the Hypothenuse; and the Perpendicular of the Gable 9, the Perpendicular of the Triangle: The Sum of the Squares of the Legs is 145, but the square of the Hypothenuse 12, is but 144, whereas they should be equal, *Euclid. Lib. 1. Prob. 47.* but the Difference is so insensible that it is thought sufficiently exact in Practice.

To avoid Multiplicity of Schemes and Problems, as to Square, Bevelling or Hipt Roofs, I shall include as much Variety as can be intelligibly done in one; and first,

P R O B. I. *The Construction of a Roof or Frame that has one end Square and Upright, and the other Bevel and Hipt. See Fig. 1.*

Let PMFG represent the Frame of a House whose Gable End PM is square, and the other End FG is Bevel and Hipt, and let the Square End PM be 12 Foot, the side MG 23 Foot, the Bevel End GF 13 Foot 6 Inches, and the side

F 4

F P

FP 16 Foot 6 Inches ; take P *v* three fourths of the Breadth of the Frame PM in your Compasses, and one Foot in P draw the Arch *b*, and with the same Extent and one Foot in M cross the Arch *b* in *b*, and draw M*b* and P*b* for the Length of the Rafters 9 Foot, Bisect BM in *a*, and FG in *n*, and draw *na*, continued to *b*, then *na* represents the Ridge of the House, and *ab* 6 Foot 9 Inches ($\frac{3}{4}$ of the Rafter P*b* which is 9 Foot) is the Perpendicular of the Gable.

Take F*n* or *nG* in your Compasses, and set it off from *n* to G, and through C draw FK and GI, which will always cross each other at Right Angles in C, draw ST Perpendicular to *an*, and continued both ways to R and V, and draw *kl* Parallel to FG, both thro' the Center C.

To find the Length of the Hips.

Take the Perpendicular *ab*, and set from C to I and K 6 Foot 9 Inches and draw KG and FI; with the Extent FI, and one Foot in F make the Arch Y; and with the Extent GK and one Foot in G cross the the Arch Y in Y, then draw GY, it is the longer Hip, and FY is the shorter

Continue the Line PM both ways to Q and Z, and set the Rafters Length MB or PB from M to Z and from P to Q, as also from S to R, and from T to V, and draw ZV and QR, then is PM*b* the Gable end, PFRQ
one

one side of the Roof; $MZVG$ the other side of the Roof, and GYF the Hipt Roof of the Level end; and if the Frame $PMGF$ were suppos'd to lie Horizontal, and the Gable PMb set perpendicular upon the Line PM ; The side of the Roof $MZVG$ folded in the Line MG , and the side $PQRF$ folded up in the Line PF , the Line ZV and QR will Co-inside and form the Ridge of the Roof, and the Points R and V will meet perpendicular to the Point C ; and if the Roof of the Hipt Bevel end FGY be folded up in the Line FG , the Point Y will also meet with R and V , and compleatly cover the Roof, and the Rafters, Hips, &c. may be cut to their respective Lengths by the Scale by which the Frame was made, and the Rafters at 12 or 14 Inches asunder, or more or less may be represented by the Lines mn, mn , &c. parallel to QP and MZ .

To find the back of the Hips to make them answer both the sides and end of the Roof; and first, to find the back of the longest Hip GK .

Lay a Scale from n to l , it cuts the Diagonal CG in x ; set one Foot of the Compasses in x and extend the other to the nearest Distance to the Line KG , and set that Extent from x to y , and draw the Lines ly and

and $y n$ which will form the Angle of the Back of the longer Hip, and in like manner lay a Scale from k to n , it cuts FG in d , set the Compasses from d the nearest distance to $F I$, and set that Extent from d to r , and draw $k r$ and $r n$, they make the Angle of the Back of the lesser Hip.

But if for private Reasons the perpendicular Height of the Roof and the Breadth of the Frame be given or determin'd, and by that means the Roof is above or under true Pitch, increase or diminish the Perpendicular $a b$ according to the given Perpendicular of the Gable, and form the Rafters, Hips, &c. accordingly.

Example Let the Breadth of the Frame be PM as before 12 Foot, but the Perpendicular is limited to 4 Foot 9 Inches, then is $a d$ 4 Foot 9 Inches the Perpendicular, and $M d$ 7 Foot 7 Inches the Length of the Rafter, equal to which $M Z$ must be made; and from this Foundation proceed in all Respects as above directed.

From what has been said a General Rule may be form'd for Roofing of all Frames, whether above or under true Pitch, the Perpendicular and Breadth being given; or if true Pitch, the Perpendicular being found by the foregoing Directions, which being known,

known, the Method of performing by Scamozzi's Lines is as follows; And in order thereto set the 30 Scales at Right Angles by Prob. 2. Pag. 82. then,

1. *To find the Length of the Rafter.*

Count half the Breadth of the House on one Leg, and the Length of the given Perpendicular on the other Leg (both on the 30 Scale) the Parallel Distance between them measured Laterally gives the Length of the Rafter requir'd.

2. *To find the Length of the Hip.*

Reckon the Length of the Rafter now found on one Leg, and half the Breadth of the House on the other Leg, the parallel Distance between them measured laterally gives the true Length of the Hip requir'd.

3. *To find the Diagonal Line.*

Set off half the Breadth of the House on both Legs, and the parallel Distance between them measured laterally gives the Diagonal requir'd.

4. *By the Diagonal given to find the Length of the Hips, by a Method different from that in Article 2.*

Set

Set off the Diagonal on one Leg, and the Perpendicular Height on the other, and the parallel Distance between them measured laterally gives the Length of the Hip requir'd.

These four last Articles are so plain, that I suppose they need no Example.

But if the Square end be to be hipt, observe the following Rules, continue the Perpendicular ab to q , making aq equal to MZ , or QP the Length of the Rafter, and draw Mq and Pq , and set the half Breadth aM or aP from a to t , then is aq the longest Rafter of the hipt end, Mq and Pq the Hips, t the Foot of the King-post, perpendicular to which i , q , and i , will all meet in a Point when folded as before proposed, and then will the Length of the Ridge be only Vi , which will co-incide with Ri , as will iP with Pq , and im with Mq , then will mo and no be short Hip Rafters, and PQi and Mzi which were of use only when the Square end was supposed Perpendicular, are now of no use at all.

By Scamozzi's Lines, to find the Hips, and Height of the King-post.

Set the 30 Lines at Right Angles, then set half the Breadth of the House aM on one Leg, and the Length of the Rafter aq equal to MZ on the other Leg (both laterally from the Center) the parallel Distance between these two Points measured laterally gives the Length

†

of

of the Hip requir'd. But to find the Height of the King-post (having the 30 Scale set at Right Angles (take the Lateral Length of the Rafter *a q* in your Compaffes, and setting one in the half Breadth of the House reckon'd laterally from the Center, turn the other Foot, and observe where it cuts the 30 Scale on the other Leg, for that reckon'd from the Center laterally is the Height of the King-post requir'd.

To find the Rafters, Hips and Angles in Frames that Bevel and are Hipt at both Ends, and are broader at one End than the other. See Fig. 2.

In those sort of Frames the middle Breadth is the Guide for the Length of the Rafters, for the Perpendiculars at each End are to be alike and equal to the middle Perpendicular; but in this Case the Rafters at the broad End must be less, and those at the narrow End more than three fourths of the Breadth of their respective Ends. if they stand square to keep the Ridge of the House upon a Level or Parallel to the Horizon; in order to which let ABCD represent the Frame of the House or Plan it stands upon, bevelling at both Ends both at AB and CD; where note if the the two Sides and two Ends be given as AD and BC, as also AB and DC, yet it is necessary to have one of

of the Angles to regulate the rest. Then Bisect AB in G , and DC in Z , and draw ZG the Line over which the Ridge of the House is to be, and upon that Line set AG from G to I , and CZ from Z to F ; through F draw rq parallel to DC , and through I draw tu parallel to AB , then through I draw the Diagonals Am and Bk , which will always cut each other at Right Angles; through F also draw the Diagonals Dn and CK , which will also cut each other at Right Angles.

Find the middle of the Line ZG as at g , in which cross ZG at Right Angles with the Line ab , three fourths of which, as is the Length of the middle Rafter bC or Cd . Now to find the Length of the Hips, and first for the Hips standing upon the Angles A and B , AI and BI represent the Distance of the Foot of the King-post from the respective Angles A and B , also IH is, by Construction, equal to the Perpendicular of the Roof or Height of the King-post; therefore in the Right Angled Triangle AIH , in which AI is the Base, IH is the Perpendicular, AH is the Hypotenuse, from thence called the Hip of the House, therefore AH and BH are the Length of the two Hips for the Angles A and B , and if AV be made equal to AH , and BV equal to BH ; these two Lines join'd in V the Triangle, ABV exactly represents the Roof of the Bevel End AB from Hip to Hip, and by the

the same Rule the Hips of the other End DC are found to be DE and CE, and the End of the Roof to be represented by the Triangle CED; and if the Hips be measured in the Scheme by the same Scale by which they were protracted, their Length may be exactly determin'd from thence.

For the Angles for the Back of the Hips, I refer the Reader to the Directions for the Bevel End of a House in the Explanation of *Fig. 1.*

The following Propositions perform'd by *Scamozzi's Lines.*

To find the Length and Angles of every principal particular Rafter in Frames broader at one End than the other.

The Perpendicular being the same in all parts of the House as hinted before, open the 30 Scale square, and setting one Foot of the Compasses in the Height of the Perpendicular in one Leg of the 30 Scale, and let the other Point in the half Breadth of the Frame on the other Leg, that Extent of the Compasses measured laterally from the Center, gives the Length of the Rafter requir'd, and to find the Angles lay a Rule to the Compass Points, whether *Scamozzi's* or any other joint Rule, and set a Bevel, and it shews the Angle at the Raising-piece, or at the Ridge of the House, to cut the Ends of the Rafters by.

*To find the Length and Angles of Collar Beams
in any Roof.*

Take the whole Breadth of the Frame in your Compasses measured laterally on the 30 Scale, and keeping the Compasses at that Extent, set one Foot in the Length of the Rafter on one Leg, and the other in the Length of the Rafter on the other Leg, that Extent measured laterally on the 30 Scale gives the Length of the Raising-piece within the Rafters; then at what Height above the Raising-piece you intend the Collar-Beam shall be, if you lay a Ruler parallel to the Line between the two Points of the Compasses, that Rule shall represent the Collar-Beam (allowing spare Wood for the Tenons) or if it be an Extent of another pair of Compasses it is the same, measured laterally on the 30 Scale gives the Length of the Collar-Beam requir'd.

For the sides C B T S and D Q P A with the length of their Rafters, &c. See *Prob. I. Page 87.* the Manner of performing being much the same as in the bevelling Hipt Roof. *Fig. 1.*



I N I S.



